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AUTHOR INDEX

Al-Issa, Ihsan 315
Anderson, Albert 99
Baumeister, Alfred A. 3
Bottrill, John 211
Brackbill, Yvonne 149
Bronzo, Anthony, Jr. 181
Bronzo, Anthony F., Jr. 185
Brower, Daniel 299
Butler, Joel R. 221
Cahoon, Richard L. 321
Cameron, Jean S. 199
Clark, Virginia A. 77
Comrey, Andrew L. 303
Costello, C. G. 231, 303
Day, Merle E. 51
De Lint, Jan 15
Dennis, Wayne 315
Franklin, Billy Joe 143
Friedman, S. Thomas 275, 281
Frye, Roland L. 221
Gavurin, Edward I. 227
Gentry, Harold W. 167
Harriman, Arthur E. 93
Hogge, James H. 275, 281
Holman, David C. 7
Horrocks, John E. 215
Inglis, James 325
Kellas, George 3
Kenney, James B. 167
Kerrick, Jean S. 77
Kitano, Harry H. L. 253
Lambert, Philip 265
Lester, David 47, 287
Lillibridge, John 119
Lintz, Larry M. 149
Lundstedt, Sven 119
Matarazzo, Joseph D. 7
McLemore, Dale 143
Miller, Richard W. 39
Nalwalk, Theodore 63
Phelan, Joseph G. 39
Powers, Gerald 181
Price, Leah M. 63
Pyron, Bernard 265
Ross, Sherman 99
Scheibe, Karl E. 19
Schmuckler, Eugene 221
Scott, J. P. 237
Shaver, Philip R. 19
Shepard, Jane H. 237
Sherman, Roger 291
Simpson, W. E. 191
Sohn, David 87
Specht, Priscilla G. 199
Sweigert, Ray L., Jr. 129
Tansey, Carol L. 325
Teichner, Warren H. 63
Tisdale, John R. 175
Weatherford, Robert R. 215
Wendt, G. R. 199
Werboff, Jack 99, 237
White, William F. 167
Wiens, Arthur N. 7

TABLE OF CONTENTS

Memory for position in undifferentiated and brain-injured retardates and normals 3
By Alfred A. Baumeister and George Kellas

A simple measure of interviewer and interviewee speech durations 7
By Joseph D. Matarazzo, David C. Holman, and Arthur N. Wiens

Note on birth order and intelligence test performance 15
By Jan de Lint

Transformation of social identity: A study of chronic mental patients and college volunteers in a summer camp setting 19
By Phillip R. Shaver and Karl E. Scheibe

Some effects of verbal conditioning on preference behavior 39
By Richard W. Miller and Joseph G. Phelan

Suicide as an aggressive act 47
By David Lester

An eye-movement indicator of individual differences in the physiological organization of attentional processes and anxiety 51
By Merle E. Day

Suprathreshold olfactory responses of the rat measured by sniffing . . . 63
By Warren H. Teichner, Leah M. Price, and Theodore Nalwalk

A method of obtaining summary scores from semantic differential data . . 77
By Virginia A. Clark and Jean S. Kerrick

Effect of spatial stability of the stimulus on free recall ability 87
By David Sohn

Intakes of NaCl by rats in extended two-bottle drinking preference tests . . 93
By Arthur E. Harriman

Mice of a four-way cross: Coat color associated with behavior and response to d-amphetamine 99
By Jack Werboff, Albert Anderson, and Sherman Ross

Some initial evidence for an interpersonal risk theory 119
By John Lillibridge and Sven Lundstedt

Communication and contrast: A case of changing social perception by indirection 129
By Ray L. Sweigert, Jr.

A scale for measuring attitudes toward student health services 143
By Billy Joe Franklin and S. Dale McLemore

The delay-retention effect in children: Roles of reward and knowledge of results 149
By Yvonne Brackbill and Larry M. Lintz

NEWS NOTES 157

Personality characteristics of teachers and their perception of organizational climate 167
By James B. Kenney, William F. White, and Harold W. Gentry

Assessing qualitative differences between sets of data 175
By John R. Tisdale

Relationship of anxiety with pain threshold 181
By Anthony Bronzo, Jr. and Gerald Powers

Preliminary investigation of AFROTC cadet attrition 185
By Anthony F. Bronzo, Jr.

Developmental changes in serial learning of word lists 191
By W. E. Simpson

Effects of placebo, Dexamyl, and Lucofen on moods, emotions, and motivations 199
By Jean S. Cameron, Priscilla G. Specht, and G. R. Wendt

The social intelligence of students 211
By John Bottrill

Peer acceptance and under- and over-achievement in school 215
By Robert R. Weatherford and John E. Horrocks

The influence of word familiarity in stereotyping a leader 221
By Roland L. Frye, Eugene Schmuckler, and Joel R. Butler

The relationship of mental ability to anagram solving 227
By Edward I. Gavurin

Two scales to measure achievement motivation 231
By C. G. Costello

Inhibitory training of dogs: Effects of age at training in Basenjis and Shetland sheepdogs 237
By J. P. Scott, Jane H. Shepard, and Jack Werboff

Japanese-American crime and delinquency 253
By Harry H. L. Kitano

The generality of simplicity-complexity of social perception in a high school population 265
By Bernard Pyron and Philip Lambert

The Scriptural Literalism Scale: A preliminary report 275
By James H. Hogge and S. Thomas Friedman

The openness and affect denial scales: A preliminary report 281
By James H. Hogge and S. Thomas Friedman

Attempted suicide and body image 287
By David Lester

Individual attitude toward risk and choice between prisoner's dilemma games 291
By Roger Sherman

Academic underachievement: A suggested theory 299
By Daniel Brower

Scales for measuring depression and anxiety 303
By C. G. Costello and Andrew L. Comrey

Cultural orientations and the use of common objects in Iraq 315
By Ihsan Al-Issa and Wayne Dennis

Effect of acute exposure to altitude on time estimation 321
By Richard L. Cahoon

Age differences and scoring differences in dichotic listening performance . . 325
By James Inglis and Carol L. Tansey

NEWS NOTES 333

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3 & 4. A study of natio-racial mental differences—N. D. M. Hirsch
5. A psychological study of juvenile delinquency by group methods—J. W. Bridges and K. M. B. Bridges
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VOLUME 2—1927

1 & 2. The mind of a gorilla—R. M. Yerkes
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1. An experimental study of the olfactory sensitivity of the white rat—J. R. Liggett
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6. The effect of segregation on the sex behavior of the white rat as measured by the obstruction method—M. Jenkins

VOLUME 4—July-December, 1928

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2 & 3. Determination of a content of the course in literature of a suitable difficulty for junior and senior high school students—M. C. Burch
4 & 5. Methods for diagnosis and treatment of cases of reading disability—M. Monroe
6. The relative effectiveness of lecture and individual reading as methods of college teaching—E. B. Greene

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2. The effect of delayed incentive on the hunger drive in the white rat—E. L. Hamilton
3. Which hand is the eye of the blind?—J. M. Smith
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5. The localization of tactual space: A study of average and constant errors under different types of localization—L. E. Cole
6. The effects of gonadectomy, vasotomy, and injections of placental and orchic extracts on the sex behavior of the white rat—H. W. Nissen

VOLUME 6—July-December, 1929

1. Learning and growth in identical infant twins: An experimental study by the method of co-twin control—A. Gesell and H. Thompson
2. The age factor in animal learning: II. Rats on a multiple light discrimination box and a difficult maze—C. P. Stone
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4. A vocational and socio-educational survey of graduates and non-graduates of small high schools of New England—A. D. Mueller
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3 & 4. A study of the effect of inverted retinal stimulation upon spatially coordinated behavior—P. H. Ewert
5. A study of the mental development of children with lesion in the central nervous system—E. E. Lord
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VOLUME 8—July-December, 1930

1. The amount and nature of activities of newborn infants under constant external stimulating conditions during the first ten days of life—O. C. Irwin
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5. An historical, critical, and experimental study of the Seashore-Kwalwasser test battery—P. R. Farnsworth
6. A comparison of difficulty and improvement in the learning of bright and dull children in reproducing a descriptive selection—F. T. Wilson

VOLUME 10—July-December, 1931

1. A comparative study of a group of southern white and negro infants—M. B. McGraw
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5 & 6. The effect of habit interference upon performance in maze learning—O. W. Alm

VOLUME 11—January-June, 1932

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VOLUME 12—July-December, 1932

1. Family resemblances in verbal and numerical abilities—H. D. Carter
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Genetic Psychology Monographs *(continued)*

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5 & 6. The limits of learning ability in rhesus monkeys—H. A. Fjeld

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VOLUME 18—January-December, 1936

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   A study of the transmission of authority patterns in the family—H. L. Ingersoll

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   The assessment of parental attitudes in relation to child adjustment—E. J. Shoben, Jr.
2. Qualitative differences in the vocabulary responses of normals and abnormals—H. Feifel
   The relative effectiveness of motion and still pictures as stimuli for eliciting fantasy stories about adolescent-parent relationships—P. E. Eiserer
   The organization of hereditary maze-brightness and maze-dullness—L. V. Searle

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   A study of the relative effects of age and of test difficulty upon factor patterns—H. A. Curtis
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VOLUME 42—July-December, 1950

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VOLUME 43—January-June, 1951

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VOLUME 44—July-December, 1951

1. The organization of hostility controls in various personality structures—S. Fisher and E. Hinds
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VOLUME 45—January-June, 1952

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Genetic Psychology Monographs *(continued)*

VOLUME 46—July-December, 1952

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VOLUME 47—January-June, 1953

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VOLUME 48—July-December, 1953

1. Age and mental abilities: A longitudinal study—W. A. Owens, Jr.
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VOLUME 49—January-June, 1954

1. Factors underlying major reading disabilities at the college level—J. A. Holmes
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VOLUME 50—July-December, 1954

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VOLUME 51—January-June, 1955

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VOLUME 52—July-December, 1955

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VOLUME 54—July-December 1956

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VOLUME 58—July-December, 1958

1. Emotional aspects of political behavior: The woman voter—E. M.

Genetic Psychology Monographs *(continued)*

VOLUME 59—January-June, 1959

1. Freshman Rorschachs and college performance—G. R. Schmeidler, M. J. Nelson, and M. Bristol
Perceptual aspects of attributed movement—R. W. Coan
Men and women: Personality patterns and contrasts—E. M. Bennett and L. R. Cohen
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VOLUME 60—July-December, 1959

1. The constancy of personality ratings over two decades—R. D. Tuddenham
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Interests of pre-adolescent boys and girls—M. Amatora
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VOLUME 62—July-December, 1960

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Longitudinal survey of child Rorschach responses: Older subjects aged 10 to 16 years—L. B. Ames
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The quantitative analysis of parent behavior toward psychotic children and their siblings—E. M. Donnelly

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An investigation of trait relationships among six-year-old children—S. A. Avakian

VOLUME 64—July-December, 1961

1. Coping patterns of preschool children in response to intelligence test demands—A. Moriarty
Studies of individual and paired interactional problem-solving behavior of rats: II. Solitary and social controls—A. Baron and R. A. Littman
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The Gesell Incomplete Man Test as a measure of developmental status—L. B. Ames and F. L. Ilg
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Functionalism and its historical significance—R. Harrison

Genetic Psychology Monographs *(continued)*

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(Manuscripts are printed in the order of final acceptance)

Memory for position in undifferentiated and brain-injured retardates and normals 3
By Alfred A. Baumeister and George Kellas

A simple measure of interviewer and interviewee speech durations . . . 7
By Joseph D. Matarazzo, David C. Holman, and Arthur N. Wiens

Note on birth order and intelligence test performance 15
By Jan de Lint

Transformation of social identity: A study of chronic mental patients and college volunteers in a summer camp setting 19
By Phillip R. Shaver and Karl E. Scheibe

Some effects of verbal conditioning on preference behavior 39
By Richard W. Miller and Joseph G. Phelan

(OVER)

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Suicide as an aggressive act 47
By David Lester

An eye-movement indicator of individual differences in the physiological organization of attentional processes and anxiety 51
By Merle E. Day

Suprathreshold olfactory responses of the rat measured by sniffing 63
By Warren H. Teichner, Leah M. Price, and Theodore Nalwalk

A method of obtaining summary scores from semantic differential data . . 77
By Virginia A. Clark and Jean S. Kerrick

Effect of spatial stability of the stimulus on free recall ability 87
By David Sohn

Intakes of NaCl by rats in extended two-bottle drinking preference tests . . 93
By Arthur E. Harriman

Mice of a four-way cross: Coat color associated with behavior and response to d-amphetamine 99
By Jack Werboff, Albert Anderson, and Sherman Ross

Some initial evidence for an interpersonal risk theory 119
By John Lillibridge and Sven Lundstedt

Communication and contrast: A case of changing social perception by indirection 129
By Ray L. Sweigert, Jr.

A scale for measuring attitudes toward student health services 143
By Billy Joe Franklin and S. Dale McLemore

The delay-retention effect in children: Roles of reward and knowledge of results 149
By Yvonne Brackbill and Larry M. Lintz

NEWS NOTES 157

Published as a separate and in *The Journal of Psychology*, 1967, **66**, 3-5.

MEMORY FOR POSITION IN UNDIFFERENTIATED AND BRAIN-INJURED RETARDATES AND NORMALS*[1]

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A. INTRODUCTION

The ability to respond on the basis of absent cues has often been regarded as particularly impaired in the mental defective. Such a notion is central to at least one deficit theory of mental retardation (2). Although a number of tests of this hypothesis have been made recently, the evidence is equivocal.

The present study is an attempt to compare further the short-term memories of normal and functionally retarded individuals as a function of retention interval. The interest here is not in whether normals are superior to retardates, but in the *interaction* between intelligence group and delay interval. In addition, a group of brain-injured defectives was included. Hawkins (3) has indicated that brain-damaged retardates may be the ones who suffer the special impairment in short-term memory.

The procedure was a modification of one introduced by Klugman (5). The subject is briefly shown a sheet of paper with a dot on it; after varying intervals he is required to reproduce the dot in the same position on another sheet of paper.

B. METHOD

1. *Subjects*

Two samples of retarded men were obtained from the population of a residential institution. One sample of 30 was classified as "mental retardation due to uncertain (or psychologic) cause with the functional reaction alone manifest" (4). This group had a mean CA of 21.6 years and a standard deviation of 4.6 years. The mean *IQ* was 60.0 with a standard deviation of 7.7. The other sample of retardates consisted of 12 residents diagnosed as "mental retardation associated with diseases and conditions due to trauma or physical agent" (4). The mean CA of the latter group was 20.8 years; the

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standard deviation 11.8 years. The average *IQ* was 54.2 with a standard deviation of 11.0. All *IQ*s were obtained either with the Stanford-Binet or with the Wechsler.

A comparison group of 30 normals was composed of undergraduate students at a state university. Their mean CA was 21.2 years. No information was available regarding the *IQ* of this group, although it should be above average for the general population.

2. *Procedures*

S was shown a sheet of 8½-inch by 11-inch paper with a black dot 2 mm in diameter located in one of 12 standard positions. In one condition, *S* was shown simultaneously a blank sheet of paper of the same size and instructed to copy the dot on the second sheet in exactly the same location as it appeared on the standard. In two other (delay) conditions *S* was permitted to study the standard for 10 seconds before it was removed. After delays of five or 60 seconds, he was given the blank sheet and instructed to reproduce the dot. Each *S* was tested under all three conditions. Twelve trials, one at each dot placement, were run in a block under each condition. Intertrial intervals were 10 seconds, and a one-minute rest interval was given between trial blocks. Presentation of conditions (blocks) was completely counterbalanced. In order to minimize active rehearsal during the delay interval, *S* was required to read letters from sheets of 150 random letters.

C. Results and Discussion

The criterion measure was *S*'s error, in centimeters, in reproducing the dot. These errors were averaged over the 12 trials for each delay condition, producing three scores for each subject. Means are presented in Table 1.

An analysis of variance was conducted on these measures. The main effects of Intelligence Group and Delay and the interaction between these factors was significant ($p < .001$). Both groups of retardates were inferior to the normals at all delays. Moreover, the differences between the intelligence groups increased reliably over delay intervals. This interaction effect was most pronounced between the zero- and five-second delay conditions. The brain-injured subjects were found to be inferior to the supposedly nonbrain-injured retardates. However, the delays were irrelevant to this difference.

These results support the notion that mental retardates, in addition to a general inferiority on the type of task employed here, are especially handicapped in situations that require them to respond on the basis of absent cues. However, the data also suggest that the interpolation of any delay is more important than the length of the delay. The mechanism underlying this deficit is not entirely clear. Nevertheless one may strongly suspect that ability to

TABLE 1
MEAN ERROR SCORES FOR DELAY CONDITION (IN CENTIMETERS)

Group	N	Condition Simultaneous	5-sec. delay	60-sec. delay
Functional MRs	30	1.4	2.7	3.4
Brain-damaged MRs	12	2.2	3.0	3.5
Normals	30	.6	1.1	1.3

mediate the cues verbally is crucially involved in the interactions found here. Length of the delay may not be particularly critical for those *S*s who can bridge the interval by effectively mediating or coding the cues involved in reproduction of the dot. Verbal mediation behavior, in fact, may represent a far more fundamental and pervasive deficit for retarded subjects than short-term memory *per se* (1).

D. SUMMARY

Two groups of retardates and normals were compared in their ability to remember the position of a dot on a sheet of paper after varying periods of zero, five, or 60 seconds. One group of retardates was diagnosed as brain-injured and the other as having functional reaction alone manifest. An interaction was found in that the less intelligent subjects were differentially handicapped under the delay conditions. The brain-damaged subjects were inferior to the functional retardates, but the delays were irrelevant to this difference. These results were taken as support for the suggestion that retardates are particularly disadvantaged in situations that require responses to physically absent cues.

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A SIMPLE MEASURE OF INTERVIEWER AND INTERVIEWEE SPEECH DURATIONS*[1]

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A. INTRODUCTION

Although the initial studies of single speech and silence units during interviews were published by Chapple (2) beginning in 1939, it was not until a decade later when the studies of Verzeano and Finesinger (13) from the Harvard Medical School and Goldman-Eisler (4) from the Maudsley Hospital were published that other investigators became interested in the research potential of these noncontent speech variables. Since then dozens of other investigators, including the present group, have been active in this field. Reviews of these studies can be found in Matarazzo (7) and Matarazzo, Wiens, and Saslow (8). Chapple's early data were collected with a pen inkwriter. Later he partially automated to an electromechanical recording apparatus which he called the Interaction Chronograph, and more recently he informs us he has developed a high speed paper tape model compatible with an IBM 1620 computer. Other investigators have developed variants of these recording systems and these are described in Wiens, Molde, Holman, and Matarazzo (15). The present authors' recording system, the Interaction Recorder, and its (high) reliability, are described in Wiens, Matarazzo, and Saslow (14). Currently the authors are testing a first operational model of their own third generation data-processing system—one that, like those of Cassotta, Feldstein, and Jaffe (1), as well as Hargreaves and Starkweather (6) and Chapple (2), can be read by an IBM data-processing system.

These recent developments of fast and highly efficient electronic data-processing systems have made obsolete the tedious ruler and hand-scoring of the pen inkwriter system of an earlier day. However this gain was purchased at the cost of bulky, relatively fixed IBM-compatible systems which no longer have the mobility of the earlier, less efficient systems. Pen inkwriters and

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Interaction Chronographs could be moved at will by investigators to any location where an interview might take place. The newer systems require the interview to take place within the range (often a matter of feet) of their fixed microphones and other immobile data-processing components. To circumvent this serious limitation, the authors investigated the possibility that their measures of single speech and silence units, instead of being recorded "live," could be derived from tape recordings made anywhere and subsequently analyzed by use of their more fixed system. The results of this study (15) clearly revealed that data subsequently analyzed from a tape recording were remarkably similar to those obtained in a live interview. This finding is of considerable importance and should further accelerate research in this area. For example, this development makes possible exchange of interview data among different investigators, as well as the recording and later analysis of once in a lifetime or otherwise unusual events, such as the study of the speech characteristics of astronauts in orbital flight by Matarazzo, Wiens, Saslow, Dunham, and Voas (10).

Despite this methodological advance one additional problem has stood in the way of research in this area, especially for young investigators. This is the cost of installing such systems initially (the basic cost of the authors' current model is over $15,000), and the continuing costs of data processing (the authors' costs run to approximately $4000 annually). Some years ago the authors began to suggest to investigators from various social and behavioral science backgrounds who wrote to them about these seemingly insurmountable cost problems that, for purposes of their research interests (often very circumscribed), a simple and inexpensive measure of one interview speech measure, duration of individual units of each participant's speech, could be obtained by a simple *word count* in each utterance. That is, from elementary principles in physics one could reason that there would have to be a high positive correlation between how many words there are in an utterance and the total length of time it takes to emit that utterance. When pressed, the authors used to venture the guess, recently for the first time in print (9), that the magnitude of the correlation would be of the order of .92.

A recent development made the authors decide that it was incumbent upon them to determine more accurately the potential of a simple word count as a substitute for the more elaborate and costly electronically derived duration of utterance measure. This was the ingenious study of Ray and Webb (12) on the relationship between the length of reporters' questions and the length of President Kennedy's answers in the 61 presidential press conferences held during 1961-63. Reasoning from the results of the astronaut study referred to above, which showed a relationship between the average length of single speech units of 14 ground communicators and the corresponding average length of reply by Astronaut John Glenn (with crossvalidation on the data with Astronaut Scott Carpenter), and the results of the authors' numerous and more highly controlled laboratory studies of this same relationship [summarized in Matarazzo, Wiens, and Saslow (8)], Ray and Webb decided to test for this possible relationship in a situation (the presidential press conference) where, because both the President and the reporters typically prepare their questions and answers in advance, the phenomenon quite likely would *not* appear. The result of their analysis was a striking confirmation of the relationship. Whether measured as correlations of three segments of each press conference (with 20 of the 61 rank order correlations over three pairs of interview segments reaching +1.00, a number twice that expected by chance), or whether computed more rigidly as a direct correlation (r of .286, p of .01) of the 1628 question-answer pairs in the 61 conferences, the results showed a clear-cut relationship between the lengths of speech of each of the two members of the dyad. That a single speaker, President Kennedy, interacted during a three-year period with numerous other speakers (reporters) constituting the other end of the dyad, rather than the same reporter, is a factor akin to the single astronaut conversing with 14 different ground communicators, and further attests to the ubiquitousness of the relationship.

For each member of the dyad, Ray and Webb used as their duration of utterance measure a count of lines in the published (textbook) transcripts of the 61 presidential press conferences. They found a reliability of .990 across pairs of two individuals who independently counted the number of lines for each participant in three news conferences. As support for their use of line count as their measure of duration of utterance, Ray and Webb (12) cite the suggestion (9) that number of words and duration of utterance should correlate "over .900." In view of the extension of the earlier results by Ray and Webb into a situation where the phenomenon (synchrony between two speakers) could hardly have been expected to obtain, and in view of the possibility that other investigators from a variety of social and behavioral science fields, stimulated by these provocative findings with an inexpensive line count, would quite likely follow up this research, the authors felt it necessary directly and thus more adequately to test *word count* (or its derivative, line count) as a measure of length of single units of utterance. This was the purpose of the present study.

B. Method

In order to carry out an effective test of their oft-repeated conjecture about the magnitude of this correlation, the authors needed an interview which would yield both measures: electronically derivable single units of speaker utterances, on the one hand, and an independent count of the number of words in each of these same utterances, on the other. Fortunately for us, Gill, Newman, and Redlich (3) already had published a carefully prepared and edited transcript of three initial interviews and a high fidelity phonograph recording of these same three interviews in the hope that "the combined printed word and sound record (could be used) for didactic and scientific purposes" (3, p. 8). Two of the interviews were conducted by two highly experienced interviewers, while the third was conducted by a novice interviewer.

To generate the word count measure for each unit of utterance for the present study, the authors used the verbatim transcript given in the Gill, Newman, and Redlich textbook. As was the case with Ray and Webb's measure of line count the authors found, for several sample pages of this text, that two counters (scorers) correlated perfectly on how many words there were in each printed unit of utterance in these published transcripts. The authors next had an observer (DCH) merely listen to the 33 RPM long-play records which accompany the text in order to become familiar with them. On the fourth listening he obtained the second measure for the authors' correlation analysis by electronically recording, on the fully automated paper tape recording system, the Interaction Recorder (14), each unit of interviewer and interviewee utterance.

Because the resulting correlations would have been gravely distorted unless the authors accurately identified and paired each unit of word count with its actual electronically measured counterpart, the authors used a system of "markers" which would help them unmistakably identify each word count unit and its electronic counterpart. This consisted merely of listening, independent of the other analyses, to the phonograph recording while reading from the printed transcript in the textbook and, by use of a stop watch, handscoring for length (time) some extra-long or extra-short units (by word count) which later would allow the authors to match the unit-by-unit paper tape print out with the unit-by-unit word count. These markers were hand-recorded and occurred at approximately every sixth or seventh utterance in the printed text.

The data thus generated allowed the authors to compute two correlations (of word count *versus* electronically derived utterance length) for each of the three interviews: one for each interviewer's speech units and one for each interviewee's speech units.

C. RESULTS

The resulting six correlations are shown in Table 1. Five of the six correlations range from .92 to .99, while the sixth one is .73. Careful further analyses revealed that this last correlation is attenuated relative to the other five as a result of the statistical artifact associated with restriction in range (5, pp. 348-352; 11, pp. 144-145). The three interviewees and the two experienced interviewers (3, pp. 132-408) each had a *wide range* in the number of words they used per utterance. Respectively, these ranges were 1-339; 1-918; 1-196; 1-102; and 1-53 words per single utterance. On the other hand, interviewer number 3, a medical student being trained in interviewing skills, had a greatly restricted range (1-22) in the number of words he used in his over 300 units of utterance (3, pp. 296-408). As a matter of fact, 188 of his utterances (61 per cent) contained five words or less. In addition, 99 per cent of this medical student's utterances turned out, from the phonograph recording, to consume five seconds or less in duration. A unit-by-unit graph of the two speech measures for each of the six interview participants clearly reveals more restricted range for interviewer 3 and makes it possible to conclude that the correlation even for him would be over .90 were it not for this purely statistical artifact. That is, the six graphs clearly reveal a similar restriction in range in the second variable (utterance duration in seconds) for this same student interviewer.

TABLE 1
THE CORRELATION BETWEEN NUMBER OF WORDS IN AN UTTERANCE AND THE LENGTH OF THAT UTTERANCE IN SECONDS

Gill, Newman, & Redlich interview	Pearson r value[a] Interviewee	Interviewer
1	.97	.95
2	.99	.92
3	.98	.73

[a] All values of r shown in this table are significant at the .001 level of confidence.

Taken together, the six correlations shown in Table 1, all significant at the .001 level of confidence, plus numerous other analyses with the means and standard deviations from the data in Table 1 which the authors performed, permit the conclusion that a mere count of the number of words in an utterance is a simple and highly valid measure of the more expensively obtained length or duration, in seconds, of this same unit of speech.

As a further test of the validity of the findings shown in Table 1, and especially to check their generalizability to interview data not recorded nor transcribed with the same high fidelity and accuracy as the three Gill, Newman, and Redlich interviews, the authors conducted a similar study (using the same methodology described above) with an interview previously tape-recorded by them and also transcribed but with no intention that it would be later analyzed in this manner. The interview, focusing on life history data, was one conducted with a student nurse by a fourth year Oregon medical student (DAM) for other research. Fortuitously this interview was conducted as part of a research design which *required* the interviewer to restrict all of his utterances to approximately five seconds' duration. Not surprisingly, then, the word count of each of his utterances in this research interview revealed a narrow range of 12-29 words per utterance; a range comparable to the range (1-22 words) of interviewer 3 in the data from the Gill *et al.* record. As recorded by each of three independent observers, each independently chronographing this single tape recording, the range in length of DAM's individual utterances was 2-8, 2-7, and 2-7 seconds, respectively. There was no prior restriction on the speech behavior of the student nurse-interviewee; empirically her words per unit of single utterance were found to range from 1-326 words, a much more sizeable range, and uniformly so. Her durations of individual units of utterance likewise covered a wide range, from 1-109 seconds (109 and 110 seconds, respectively, for the two other observers).

For the interviewee data, the correlational results shown in Table 1 were strikingly confirmed; each of the three (independent) scorers' Interaction Recorder-derived length of her single utterances correlated .98 (p of .001) with the simple transcript-derived count of the number of words in each of her same utterances. In addition, and as expected, the narrower range in interviewer speech behavior produced the hypothesized lower correlations for the interviewer speech data. More specifically, data from the three observers' Interaction Recorder inputs for the student-interviewer correlated with word count as follows: .43 (p of .001), .72 (p of .001), and .65 (p of .001), respectively. Detailed analyses of these three records again revealed that these seemingly lower correlations represent merely a statistical artifact, in line with the authors' expectation, and that they would each be above .90 were it not for the fact that both variables, number of words and length, vary over a very small range, as had been the plan in this particular research interview.

This last set of analyses of an interview conducted and transcribed under conditions which might be found in many laboratories, plus the analysis shown in Table 1 of interviews with remarkably high and unusual accuracy and fidelity in recording and transcription, appear to stand as a confirmation of the authors' earlier guess that such a correlation should be of the order of .92

and thus lead us to conclude that, *if carried out carefully,* a simple word count is a very accurate and inexpensive measure of electronically derived length of speech utterance. Investigators thus may use word count as a measure of speech length with considerable confidence.[2]

The authors have used two additional speech variables in their research to date (8, 9). The first of these two remaining variables, frequency with which one speaker *interrupts* his partner, also can be obtained inexpensively: namely, from a *frequency count* derived by a careful listening to the same tape recording from which the word count measure itself also is being generated.

To date the authors have not devised an inexpensive method which they can recommend for obtaining the third speech variable, *latency* (or reaction time) before one partner answers the other. Since differences of tenths or hundredths of a second in this variable have been found by the authors to be important, the usual and low cost stop watch appears not feasible as an inexpensive tool for recording interviewer-interviewee reaction times. However, there currently are available numerous highly accurate and still relatively inexpensive chronometers. With a little practice, and adequate use of "markers," plus one or two reliability studies across scorers or other observers, even this measure (latency before speaking) can be obtained simply and relatively inexpensively from tape recordings or "live" interviews.

Research on speech and silence measures, especially by students with limited funds, or by those more seasoned investigators who in the past have studied only the content of interviews and avoided noncontent measures because of cost in time or funds, now appears feasible without expensive equipment or huge annual budgets.

D. Summary

Investigators in psychology, sociology, anthropology, journalism, and linguistics are showing increasing interest in study of such noncontent dimensions of speech behavior as frequency and duration of single units of utterance, latency, and interruption. The present paper describes a simple and inexpensive measure (word count from a transcript) which can serve as a highly reliable substitute for one of these, the more expensive and electronically derived duration of utterance measure. Suggestions for obtaining inexpensive measures of the other two variables are offered.

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[2] While reading proofs of this manuscript, the authors learned of an earlier study on this same problem which, although mentioned in passing, reported an r of .91 between "number of words" in interview utterances and "number of seconds of talking." Mahl, G. F. Exploring emotional states by content analysis. In I. Pool (Ed.), *Trends in Content Analysis.* Urbana, Ill.: Univ. Illinois Press, 1959. Pp. 115.

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NOTE ON BIRTH ORDER AND INTELLIGENCE TEST PERFORMANCE*

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Whereas scientific achievement among British and North Americans decreases with birth rank (2, 5, 6), mean intelligence increases (10). It is noteworthy that controlling for the effects of family size—and therefore of socioeconomic status—does not alter these apparently contradictory results. In populations of scientists the ratio of eldest to youngest ranges from 1.3 to 1.7, which indicates that the early born are overrepresented regardless of family size (3). In the study of intelligence and birth rank, pairs of school children were drawn from the same families and the later born were found to have superior intelligence (10).

It might be expected that the presence of older siblings and the experience of more consistent parental affection (8), less frustration during infant weaning (7), and better parental care (9) would tend to improve the intelligence test performance of later-born individuals at school age. On the other hand, it is an open question as to whether or not birth-order differences in such performance also obtain at a more advanced age.

To examine the latter possibility, data on birth order, sib size, and intelligence test performance were examined for a sample of 201 adult males. The relevant data for this sample had been collected in the course of a large scale survey of chronic drunkenness offenders.[1] The sample therefore comprised persons who had been convicted three or more times for public intoxication in the year prior to their testing.

However, it should be stressed that the selection of this sample was dictated solely by the availability of the relevant data. The intelligence scores of the group were lower on the average than might have been expected for a group of adult males of similar mean age (46 ± 10 years). But it was felt that if the relationship between birth rank and intelligence test performance observed for school-age children also held for a sample of chronic drunkenness offenders it could be safely assumed that it would endure a more normal adulthood.

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[1] Project 52, Alcoholism and Drug Addiction Research Foundation. Principal investigators: P. J. Giffen and G. Oki. Final report in preparation.

TABLE 1
ORDER OF BIRTH OF 201 ADULT MALES

Sibship size	1	2	3	4	5	6	7	8	9	10	11
1	7										
2	13	7									
3	9	6	9								
4	6	7	4	10							
5	3	2	8	3	5						
6	2	4	6	6	4	7					
7	1	3	4	2	4	1	2				
8	1	4	—	6	2	1	1	2			
9	1	—	1	5	1	1	1	—	1		
10	—	—	1	2	1	1	—	1	2	4	
11	1	1	2	2	—	—	1	1	—	1	7[a]

Order of sibship (columns 1–11)

[a] This group comprises 11 and over birth ranks in 11 and over sib sizes.

Table 1 summarizes the birth order and sib size data.

To measure the effect of birth rank on intelligence test performance, the scores on the Wechsler Adult Intelligence Scale of the 95 only- and earlier-born subjects were tabulated and compared with those of the 89 later-born subjects in the sample. The scores of the 17 middle born—e.g., the second born in sibs of three, third born in sibs of five, fourth born in sibs of seven, fifth born in sibs of nine—were excluded from this analysis.

The mean intelligence test score of the only and earlier born was found to be 90.76 compared to 94.92 for the later born ($t = 2.33$, with 182 *df*, $p < 0.025$).

Thus it would seem that birth order not only affects intelligence test performance at school age but also at a more advanced age. Therefore, since scientists have been found predominantly among the early born, the question arises as to how closely intelligence test performance is in fact related to scientific achievement.

The answer may come from a detailed analysis of differences in the learning environment by rank of birth. It is known that the later-born child enjoys more consistent parental affection, improved parental care, and the presence of older siblings. One may speculate that the earlier-born individual compared to the later born is less likely to be presented with a clear and consistent cultural image and is probably exposed to new phenomena in a more stressful way. They may therefore tend to be relatively marginal in their home and school cultures, and marginality and creativity have often been associated on impressionistic grounds (1). In addition, it has been shown that the earlier born tend to be more curious (4) than the later born. These factors may take precedence over intelligence test performance in the etiology of scientific achievement.

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TRANSFORMATION OF SOCIAL IDENTITY: A STUDY OF CHRONIC MENTAL PATIENTS AND COLLEGE VOLUNTEERS IN A SUMMER CAMP SETTING*[1]

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A. Introduction

It is no longer novel to register doubt about the legitimacy of the term "mental illness." A sample of objections to the use of the term might begin with the allegation of implied dualism and the suggestion that mental illness is a metaphor illicitly transformed into a reality. Also, there is the objection that "mental illness" is a vestige of the proprietary jurisdiction of the medical profession for problems of behavioral deviance, a jurisdiction arrogated by physicians from theologians in the secularistic trend following the Renaissance. Thirdly, there is the practical objection that the grouping of behavioral disorders, which are necessarily socially relative, with physical disorders, which are not, has been functionally inadequate, since effective cures for such disorders have not been developed and existing remedies are at best irregular in their success.

Even though psychologists (12), sociologists (3), and psychiatrists (17) have stated these and other objections with great force, it is still appropriate to describe any conceptual shift as "new," for in practice "mental illness" is still firmly entrenched. This state of affairs is consistent with Conant's observation that theories are not destroyed by negative criticism but only by better theories.

It is the purpose of this paper to describe a single example which illustrates how a theoretical conception might be evolved and applied to replace the concept of mental illness, although the experience to be described—a summer camp for chronic mental patients staffed largely by nonprofessional college students—was less a product of explicit theorizing about social deviance than the product of a series of practical exigencies in the operation of a state mental hospital system.[3]

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[2] Now at the University of Michigan in Ann Arbor.

B. SOME THEORETICAL BACKGROUND

Fortunately, there have arisen out of the objections to the "mental illness" metaphor some suggestions as to how the reference problems—maladjustment, bizarre behavior, delusions, etc.—might otherwise be handled. Some of these suggestions are remarkably close to what was already happening in Connecticut's summer camping program. Of particular use are the arguments offered by Sarbin (13) that "mental illness" and the process of becoming a mental patient may be viewed as a process of the degradation of social identity, a process which might at least theoretically be reversed so as to regain "human" status for the individuals so degraded.[4]

A brief description of the relevant features of Sarbin's analysis will prove useful. A person's social identity is considered to derive from the particular set of social positions he has validated. The roles associated with these social positions vary in the extent to which they are achieved by the person as a product of his own election and effort, as opposed to being ascribed or granted to him as part of his "birthright."[5] Further, roles vary along an involvement dimension, with greater potential variation in role-involvement in the more achieved roles. The critical feature of this model of social identity concerns the relation of these two dimensions, *ascription-achievement* and *involvement,* to *value* for social identity. In general, the potential for positive value is considered to increase with achievement, while potential negative value is greatest for the most ascribed components of social identity. That is to say, a person has much to gain and little to lose in opting for achieved positions, but he has much to lose and little to gain with respect to his ascribed positions. For example, the negative consequences of improper enactment of the role of male are much greater than the negative consequences of failing in a new business venture. Yet a person receives very little positive credit for acting like a man, since he is merely fulfilling minimal expectations, whereas great positive rewards derive from success in a new business venture.

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[3] In 1958 a recreational camping program was developed in Connecticut as a means of providing rewards for some patients in the state mental hospital system and of alleviating the humdrum existence on chronic wards. Because of staffing difficulties college student volunteers came to be used at the camp. Shortly thereafter physical resources for developing and expanding the camping program became available to the Connecticut Department of Mental Health.

[4] A paper currently in preparation by one of the present authors (K.S.), Professor Sarbin, and Professor Rolf Kroger, will discuss this problem in detail.

[5] This dimension, which will be referred to as the ascription-achievement dimension, is derived from the distinction which Linton (8) introduced. The important difference here is that Linton's dichotomy has been developed into a continuum.

The modifying function of the involvement dimension for this relationship can be summed up in two statements. First, the potential range of value, positive and negative, varies directly with involvement. Second, since involvement must remain at a high level for more ascribed roles, the possibility of suffering great losses in the value of social identity is more pervasively present throughout time than opportunities for positive involvements. A corollary of the last proposition is that the negative consequences of departure from ascribed role expectations are relatively inescapable through disinvolvement, while one may easily escape the negative consequences of failure of achieved roles by the simple expedient of total disinvolvement from the associated social position.

The application of this model to the case of the mental patient is straightforward. The chronic mental patient has been stripped of virtually all his achieved statuses, and is located as a deviant with respect to most of his ascribed statuses. To be a sick person is to be a person temporarily without basic human rights, such as autonomy in making decisions about where to live, what to eat, what to wear. To be mentally sick is to be identified as a person without basic human status, for effective mental functioning is an essential attribute of humanity. This does not mean that mental patients are treated cruelly, in the ordinary sense of that term. The same humanitarian ethic that protects animals and children from physical cruelty also protects the mental patient. Patients may even be greatly admired within the mental hospital. However, the basic fact of life for the chronic mental patient is that he has failed at proving himself to be a fundamentally sound human being. Living in a chronic ward under the supervision of authoritarian caretakers, yielding to prescribed medications from often unseen physicians, the human degradation of the chronic patient is constantly enforced.

The question of the reversibility of this condition should certainly not be prejudged. Success does not automatically follow from merely agreeing to rehumanize the chronic patient by involving him again in achieved positions and by granting him the dignity of human status. Yet it does follow from the conception that, if rehumanization has any chance of success, the ordinary mode of life of mental patients is diametrically opposed to this possibility. As many authors (3, 17, 18, 20) have argued, the mental hospital, like the prison (16), is a dehumanizing and pathogenic agent.

The camping program to be described here is an example of a possible mode of promoting persons out of the mental patient role. Attention also will be given to the performance and reactions of the involved students, who functioned as agents of potential change.

C. The Connecticut Service Corps Camping Program

Since the mid-fifties an increasing number of nonprofessional personnel, notably college students, have become engaged in work with chronic institutionalized mental patients (6, 7, 19). In most of the programs described, students visit a large hospital once or twice a week to converse with the patients, take them for walks, involve them in games, and so on—in short, to bring some of the "outside" environment into the hospital.

Scheibe (14) has reported on a more intensive program, the Connecticut Service Corps, inaugurated in 1963 by the Connecticut Department of Mental Health. Students are assigned to four state hospitals, where they are provided with living facilities and $200 for a two-month summer project. They spend a regular working week on chronic wards interacting with patients. In 1963 and 1964 some of the students acted as staff for a two-week camping program.

In 1965 it was decided to build a special camp for the benefit of chronic patients to be operated for a full summer with its own unit of Service Corps as staff. This summer program, occupying most of July and August, 1965, is the subject of the following description.

1. *Description of the Camp*

The camp was located in a forested area on the banks of a small freshwater lake in northeastern Connecticut. When the summer program began, the campsite was almost completely undeveloped. Patients and staff lived in large army tents raised on wooden platforms. Breakfasts and weekend meals were cooked on an open fire; other meals were brought in from a local high school.

Two swimming areas were roped off in the lake near the tent area, one shallow and thus suitable for nonswimmers, one deeper. An arts and crafts program was conducted in a converted pumphouse near the lake. Recreation facilities were built by the inhabitants of the camp during the summer. These included a boat launching ramp, diving raft, and areas for basketball, volleyball, badminton, and horseshoes. Several "indoor" games (e.g., checkers, cards) were also provided.

2. *Staff*

The program was directed by a clinical psychologist. His assistant, a member of a college athletic department with no previous experience in the field of mental health, bore the title of "program director." Both these men lived in tents with their wives and children. (The five children were residents of the camp for most of the summer.) The remainder of the staff included a quartermaster (a psychiatric aide), waterfront director, arts and crafts instructor, camp crafts director, athletic director (also an aide), and a nurse.

In addition to this professional core there were 17 college students chosen by the American Friends Service Committee who had applied as summer volunteers. Although chosen separately, they were considered to be members of the Connecticut Service Corps. They ranged in age from 18 to 27 and came from 15 different colleges in 10 states. Except for college courses in psychology and sociology, none had been specially trained to work with mental patients; 13 had rarely or never visited a mental hospital. One of the volunteers, a girl from Ireland, arrived after the program had begun and was therefore excluded from most of this study. All further specific references to the students will, therefore, include only the other 16. Eight were male and eight were female.

3. *Work Routine*

Plans had been made early in the year to erect permanent buildings at the campsite—complete with water, electricity, indoor cooking facilities, and recreation areas—but unforeseen complications delayed construction.[6] Therefore, when the student volunteers arrived to begin work, they found it necessary to erect tents, build washstands, dig fire pits, and clear paths. By the time the first group of patients arrived, the woods had been transformed into a habitable camp, but living conditions were still quite primitive.

In order to develop the camp further, the daily program necessarily included work as well as recreation. Staff and patients always worked together—at everything from chopping trees and clearing stumps to building fires and cooking breakfast. A typical day included breakfast, a general meeting for discussion of scheduled activities, and morning work projects. Lunch was followed by a rest period which was often used for staff meetings or seminars, and a brief work period, after which water games, boating, fishing, athletics, and arts and crafts occupied most of the campers until supper. After supper the campers had a "free period" for group or individual games, followed by an evening program of campfire singing, skits, or dances in which everyone participated.

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[6] An aura of uncertainty as to the provision of physical necessities was one of the most notable features of the entire summer. The state bureaucratic machinery, with the best intentions, was not equal to the task of implementing these first year plans. Great credit is due to the physical endurance and improvisational talent of Dr. Richard Wiseman, director of the camp, and of the Connecticut Service Corps.

4. *The Patient-Campers*

Seventy-nine adult patients lived at the camp for some period of time, 49 for two weeks, 11 for seven weeks, three for four weeks, one for three weeks, and the remainder for one week. The two largest categories were "for the summer" (seven weeks) and "for two weeks." The two-week patients came in three separate, consecutive groups: 20, 20, and nine. All patients were adult residents of chronic wards in Connecticut's four state mental hospitals. Most were between the ages of 35 and 55, and the predominant current diagnosis was some form of schizophrenia. Length of stay since latest admission ranged from one to 33 years and averaged 12.15 years. Patients were selected at the discretion of each of the four state hospitals. Hospitals were provided with quotas for given camping periods, and worked from there on their own. The criteria for patient selection were by no means uniform.

Sometimes patients made explicit requests to be allowed to go to camp and were sent. Other patients were "drafted" and may not have been completely willing to go. Some patients appear to have been sent to camp as a reward for good behavior—others were sent "for their own good," sometimes with less than a day's notice. As will be noted later, this procedure of patient selection led to some problems.

5. *Modes of Patient-Staff Interaction*

Deliberate efforts were made to abandon the illness metaphor while patients were at camp. Most simply, they were always referred to either by name or as "campers" rather than patients. This was part of a larger attempt to break down the traditional "helper-helped" role relationship (17) characteristic of mental hospitals. Vertical differentiation of roles was reduced as much as possible. Moreover, no one wore a white uniform and, as mentioned, the few hospital personnel who were employed bore titles reflecting their status in the camp, not in the mental health profession. Most of the patients received medication, but it was distributed inconspicuously by the camp nurse and was seldom a topic of conversation.

The student volunteers who provided most of the enthusiasm and energy for the program were relatively unfamiliar with professional terminology, and they tended naturally to approach patients in normal ways, treating them as "people"—with idiosyncrasies to be sure—but not with "symptoms" and traditional nosological classifications. Students were encouraged by the director to explore techniques of their own device for dealing with blatant deviance, rather than accept a single approach as necessarily correct or "best."

In terms of the previously sketched social identity model, the behavior of staff to campers may be seen as an acceptance of the campers most fundamentally as persons, not as patients. Since the patients were first presented to the students at camp and not in the setting of a mental hospital, the acceptance was facilitated. Moreover, it seems fair to attribute some importance to the naivete of the students, for their behavior with the campers was based upon generalizations of their social knowledge of dealing with "normals." They had no fund of experience on which to draw for treating the campers as "insane" or "mentally ill."

Moreover, the camp setting offered abundant opportunities for recognized achievements, however transient their effects on the social identities of the campers. Originally, the camp had been conceived as a recreation medium only. But, as it developed, several hours a day were taken up by relatively hard work, and many of the campers seemed to enjoy contributing to the effort.

Diligent or excellent labor was regarded with honest gratitude and praise from fellow campers—patients and staff. Camp improvements were appreciated by the entire "community." One of the male campers indicated increased interests explicitly: "I haven't felt like working in over five years, but being here makes you feel alive and you want to work. You know that every little bit of work you do is going to add to the camp and is going to benefit somebody."

In the hospital many of these patients had no jobs. Those who did have jobs or were in occupational therapy often worked away from their wards, so that positive valuation from fellow ward members was rare.

At camp there was a wide variety of activities. Therefore, an individual had numerous opportunities to establish some kind of reputation for effort or skill. Some of the men, for example, surprised the students with their ability to use camping and building tools. Others proved to be talented athletes (despite, in many cases, the dulling effects of drugs and prolonged inactivity on the wards).

Women were encouraged to help with cooking and cleaning, and frequently they made known at breakfast that "I cooked those eggs you're eating," or "I'm the one who volunteered to get up at 6:30 A.M. to start the fire." Also, they could participate in the daily arts and crafts projects.

The evening program gave all the campers a chance to perform before a group. Some were good singers, a few had acting ability, and most were willing to try—especially with support and coaxing from the students, who contributed ideas for skits and charades, partners for duets, and encouragement when it was needed.

Campers were, for the most part, allowed to dress as they pleased. In some cases the hospitals issued them special camp clothing—shorts, sweatshirts, summer blouses, etc.—so that personal identity might have been easier to establish by dress than it is in the hospitals where dress is quite undistinguished and uniform. While the atmosphere was always relatively informal, students sometimes attempted to transform an unkempt, indifferent hairdo or outfit into something more attractive.

Camp life demanded a considerable degree of independence and responsibility. Campers could decide how they would spend much of each day (although a suggested program was outlined by planning committees). They were expected to fulfill committee assignments, just as were staff members. Their suggestions regarding changes in schedule or planned activities were accepted as serious and worthwhile. Experienced campers took responsibility for showing newcomers around the area and for explaining such customs and rules as lunch line procedure, and smoking and waterfront regulations.

Interpersonal conflict and problems did arise with some frequency, but they were handled with relative ease by the clinical psychologist-camp director. He could observe the entire context of problems and could deal with them immediately.

He reported:

> The professional person, because of his continuous observation, is in a better position to handle crisis situations with a patient—on the spot, instead of through second-hand or superficial channels. Thus, when a patient is upset and wants to "talk" to the therapist, the therapist doesn't have to guess or infer what the total situation was, but is able to see the circumstances that surrounded it and then better evaluate the situation. A clear example of this occurred when a patient this summer suddenly stormed out of the tent, determined to go back to the hospital and extremely angry with a Service Corps girl. Having seen the situation develop, I was able to talk to the patient with all the relevant facts and was able to show her what had happened. Handling the patient's feelings on-the-spot thus made it understandable to the patient and she was able to see that her reaction was inappropriate. This led to a serious introspection of her typical way of relating to people.[7]

Furthermore, since the director spent the greater portion of each day with the patients—working, swimming, singing, and eating—he was seen as less professionally distant than hospital doctors.

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[7] Wiseman, by permission, from his report to the Connecticut Department of Mental Health.

D. Student Reaction

Living with chronic mental patients 24 hours a day might be expected to have a significant effect on untrained college volunteers. Students participating in the project were given a four-hour battery of tests and questionnaires in group sessions during the first week of the summer program, before any patients had been sent to the camp. A revised battery of similar length was given in the last week of the program, after all patients had returned to their respective hospitals. Elapsed time between the two administrations was about seven weeks. Questionnaires were designed to elicit opinions about mental health, mental hospitalization, and the potential of the camping program. Individual taped interviews were conducted with all students at the beginning of the summer, and again at the end. In addition, one of the authors (P.S.) spent the summer at camp and kept written observations of interactions, activities, and problems.

Follow-up questionnaires were completed by mail six months after the termination of the program to determine vocational goals at that time, extent to which contact had been maintained with patients, and retrospective evaluations of the summer experience.

It may be simply stated that there were virtually no negative effects on the students. No one dropped out of the program because of disillusionment or depression, nor was anyone asked to withdraw. There were indications of mild depression toward the end of the first week when the magnitude of their challenge became apparent. But no student showed signs of serious emotional disturbance during the summer. None required more than routine counseling (provided by the camp director) or a few days away from the camp.

Rotter's Incomplete Sentences Blank (11) was included in the pre- and posttest batteries as an indicator of maladjustment. No significant change occurred in mean score for the 16 students over the summer (using a *t*-test for correlated means).

The California Psychological Inventory, CPI (5), was administered pre and post to detect personality changes that might occur as a result of the summer experience. Significant increases ($p < .05$) were recorded on the following scales: Capacity for Status, Sociability, Social Presence, Self-acceptance, Communality, and Achievement via Conformance.

These changes consistently indicate an increased ability of the students to work well and happily in close proximity to others. The summer seems to have served to increase both their confidence and desire to achieve personal goals while working within the limits imposed by social groups. This increased acceptance of society, if it may be called that, is paralleled by an increased acceptance of self. While this pattern of change on the CPI has not been found to be a test-retest phenomenon (15), these remarks should be interpreted as tentative and speculative. The specific setting of the testing might have introduced "demand characteristics" (9) for the kinds of changes reported.

These findings are corroborated by the change in mean score on Rotter's I-E (internal-external) Scale—a measure of a general tendency to see the locus of control for reinforcements as due to personal capacities and efforts as opposed to external circumstances. The students, on the average, came to believe more in internal control during the summer. This result must also be interpreted with caution, since it is common for subjects to show a small drop in score over time (10), but the change in this study was significant at the .001 level (*t*-test for correlated means).

Two attempts were made to detect changes in attitudes about mental illness and conceptions of mental patients. One employed a 70-item Q-sort procedure designed by Block (2). The students were instructed to complete the sort so that it described "mental patients." No significant change in conception occurred over the summer as detected by this inventory. The correlation between pre- and postdescriptions was $r = .94$. The 10 most characteristic and 10 least characteristic adjectives for the pre- and postdescriptions appear in Table 1.

Table 1 indicates that stereotypes the students brought with them about mental patients were not modified by their experience. If experience leads to veridicality, then it must be said that the experience only confirmed a correct notion of what mental patients are like. However, this does not necessarily refer to the students' generalizations about the patients with whom they actually worked. Instructions were to a degree ambiguous in the intended reference for the Q-sort description. This finding mainly reinforces what has been reported elsewhere (1, 4): i.e., that "mental patients" is one of the most negative of all human categories.

The second inventory was a 77-item questionnaire entitled "Opinions About Mental Illness." Students were asked to rate each item from 1 to 7, the former representing strong agreement, the latter strong disagreement. A rating of 4 meant "can't decide or have no opinion." Significant changes from pre to post (*t*-test for correlated means, $p < .05$) occurred on the nine items listed in Table 2. Table 3 includes the five statements with which the students agreed most at the end of the summer, and the five with which they most strongly disagreed.

These tables offer more explicit evidence about students' conceptions and changes in conceptions over the summer. One might generalize to say the

TABLE 1
STUDENTS' PRE- AND POSTDESCRIPTIONS OF "MENTAL PATIENTS"
(Derived from Block's[a] 70-item Q-sort)

Variable	Pre	Post
Most characteristic	withdrawn, introverted defensive easily hurt worried and anxious suspicious disorderly dependent undecided, confused unhappy uninterested, indifferent	dependent self-pitying unhappy undecided, confused worried, anxious defensive impulsive uninterested, indifferent withdrawn, introverted suspicious
Least characteristic	bossy reasonable fair-minded, objective personally charming confident sophisticated wise versatile persevering poised	persevering wise self-controlled sophisticated ambitious fair-minded, objective poised versatile bossy confident

[a] See Block (1).

students consider patients to be benign, approachable, unfortunate, and deserving of special care, respect, and understanding. Table 2 indicates a change to a more conservative view regarding the potential effect of the Service Corps program. There is evidence also of a growing skepticism about what the hospitals are doing for mental patients. Several of the items are consistent with the generalization that students feel it necessary and worthwhile to "move in" on the patients, to "prod" them to active, responsible life.

These interpretations are supported by students' comments in postinterviews. Most were convinced that several patients had benefited significantly from the camping experience, but that no long-term gains could be expected if patients were returned to routine life on chronic wards.

One of the five most agreed-upon statements indicates a desire to get information regarding careers in the mental health or related fields. At the beginning of the summer only six mentioned this as their primary motive for joining the program. The others had volunteered for a variety of reasons, such as "a desire to help someone," "to 'produce' in a nonacademic way," or "to grow personally through relations with a different kind of people." Six months after the program ended, however, 13 of 15 students who returned the follow-up questionnaire mentioned the importance of the summer experience as an influ-

TABLE 2

OMI STATEMENTS WHICH RECEIVED SIGNIFICANTLY DIFFERENT RATINGS AFTER THE SUMMER PROGRAM

Rating		
Pre	Post	Statement
4.62[a]	3.06	Most of today's mental patients come from broken homes.
4.06	2.56	Many mental patients would remain in the hospital until they were well even if the doors were unlocked.
5.62	4.19	Many individuals working in mental hospitals are themselves somewhat "unbalanced."
5.19	3.81	One of the main causes of mental illness is the lack of moral strength or will power in the individual who is ill.
4.69	3.37	Patients who show no interest in playing games or keeping themselves active in any way should be forced to participate because once they become involved they will enjoy it.
3.81	2.56	Most mental patients can take care of their physical well-being.
6.37	5.25	It is fairly easy to recognize someone who once had a serious mental illness.
4.06	5.19	Mental patients should be treated no differently from normal people.
4.00	3.25	To hope for complete recovery of patients with whom the Service Corps works is much too idealistic a view.

[a] A rating of 1 donates complete agreement, 4 uncertainty or neutral agreement, and 7 complete disagreement.

ence on career plans. The particular types of influence were quite varied. For example:

1. The experience confirmed my decision of the preceding semester to go on into psychology; it was a test summer.
2. I have wanted to teach elementary school for a long time but before last summer I hadn't thought of the possibility of working with emotionally disturbed children.
3. I found I don't have the personality traits needed in social work and that I'm more interested in working with things than with people. However, I'm still considering some form of social work as a career, particularly occupational therapy, because I enjoyed the warm interpersonal relations in the camp.
4. It was the basis of my decision not to go into clinical psychology. (This student is now in experimental psychology.)

TABLE 3

OMI STATEMENTS WITH WHICH STUDENTS AGREED AND DISAGREED MOST STRONGLY

Postrating	Statement
	Agree
1.56	Most patients in mental hospitals are not dangerous.
1.75	Many mental patients are capable of skilled labor.
1.87	More than anything else, mental patients need the respect and understanding of the staff members who work with them.
1.94	For me, an important function of this Service Corps experience will be forming relationships with individual mental patients.
2.00	An important aspect of the Service Corps experience is the insight it may give me into professional areas I am considering as my life's work.
	Disagree
6.25	There is nothing a person can do for himself to prevent a severe mental illness.
6.37	I joined the Service Corps to obtain pay and summer accommodations.
6.56	There is no such thing as MENTAL illness, *per se,* but only illness caused by a physical defect of some kind in the brain.
6.81	Regardless of how you look at it, patients with severe mental illness are no longer human.
6.81	There is little that can be done for patients in a mental hospital except to see that they are comfortable and well fed.

Additional comments expressed "personal growth," increased self-confidence, greater appreciation of others' problems, and altered ways of viewing people in general.

> This gives me a completely different attitude toward mentally ill people—much more tolerant and sympathetic—and it also has changed some of my values; now I feel that it is tremendously important for people to be accepted by someone, sometime—to have some relationship in which they feel secure—and I have begun to de-emphasize the importance of intelligence and value more kindness toward other people, and am trying to think more in terms of understanding others rather than judging them.

In short, all information supports the conclusion that an intensive camping experience with chronic mental patients had an important effect on the student volunteers studied. None of them seemed to be harmed by the experience; in fact, average test scores for the group indicate a number of benefits. Six months after the end of the summer program, students still viewed their experience in a positive light and as important to their future plans.

E. Reactions of Patients

It is difficult enough to obtain a valid measure of chronic patient improvement, but even more difficult to relate observed change to a specific cause, such as the camping program. Release rates, which can be meaningful indices for shorter term patients, are low by definition for chronic patients. Also, in this particular case, several other factors have impinged on some of the patients which may have effected change independent of the camping program—for example, ward changes, changes in medication (including use of experimental drugs), changes in hospital organization, and new therapy programs within the hospital. Of course, a definitive evaluation is impossible without a matched control group of patients who did not attend the camp. Given these difficulties and limited information, interpretations must be cautious.

At the close of the camping season each of the students was asked to rate each patient on a six-point evaluation scale which included the following descriptive phrases:

1. Significant therapeutic gain, better adjustment, likely to have a lasting effect.
2. Had an enjoyable experience, but it is unlikely that there will be any significant long-term gains.
3. Although not significantly changed, was a therapeutic agent for other patients.
4. Seemed neither to benefit from, or be harmed by, the experience.
5. Had a negative effect on self or other patients.
6. I didn't get to know this patient well enough to judge, or I can't remember this patient.

Of the 79 patients, 40 were rated by at least one student as showing a significant therapeutic gain. Nine of the 40 were so rated by over half the students. This category was used an average of 10 times per student for the 79 patients—five of the 10, on the average, being applied to the "full summer" campers. The second category was used most frequently, corroborating interview statements that even in cases where patients' performance did not promise dramatic recovery, the camping program had at least given pleasure to the campers. The fifth category ("had a negative effect") was used an average of five times by each student, half of these describing three particular patients from the "full summer" group (two of whom were returned to the hospitals).

A follow-up study of patient records was made approximately one year after the camping experience. At this time nine of the 79 patients had been discharged from the hospitals (two of these to convalescent homes, the others were not released to institutions). One other was being considered for discharge.

Since these figures give no information about most of the patients, and do not supply causal links, psychiatrists who were responsible for the patient-campers were interviewed to determine their evaluation of the camp's effects. Most of them had not seen the camp and were not involved in its operation. Therefore, their impressions can be considered to be relatively unbiased by personal connection with the camping program.

All gave favorable reports. Some attributed significant patient improvement to the camping program (including three discharges). Specifically, several patients became more interested in the possibility of their release; they spoke more frequently of conditions outside the hospital. Some were noticeably more confident after finding that they could live successfully among normal people away from the hospital. Some were more interested in working and have since found outside jobs.

All the psychiatrists interviewed agreed that their patients enjoyed going to camp. Getting out of the hospital and into a more varied and active environment was seen as beneficial for almost all patients. In short, the camping experience was described as at least enjoyable, and at most a significant contributing factor to the improvement of a few patients.

F. SPECIAL PROBLEMS

For a few patients the physical and social environment at camp required too much independence and self-determination. They felt threatened by the lack of rules and emphasis on individual achievement. Two patients out of 79 were returned to the hospitals for this reason. One was a man who absolutely refused to work; no amount of coaxing from the students was sufficient to change his mind. The other was a woman who repeatedly tested the few existing limits on behavior, apparently seeking to establish some clearer notion of what was allowed and what precisely was expected of her. She was the only patient in the summer or two-week camping groups to wander out of camp (which was not fenced in or guarded). It is possible that careful screening could eliminate most of such patients from the camping program before they are sent.

Little planning had been done in the hospitals prior to sending patients to camp; patients were not notified much in advance that they would be going, and no unified criteria for selection were established. For future programs the director has recommended that "selection for camp be made on the basis of a total treatment plan for each patient" and that "the purpose for sending him be spelled out with specific goals defined and . . . [that progress be] evaluated at the termination of the camp season . . . ."[8]

Also needed is a follow-up program in the hospitals, so that patients who are helped by the camp experience will not be allowed to sink back into the familiar routine of ward life. The military axiom that one should take pains to reinforce success might well be applied in the mental hospital. There is no evidence that special efforts were made to preserve apparent patient gains made at camp, such as beginning group therapy sessions with them.

A problem mentioned by several students in the postinterviews was lack of a formal education program. At times they wanted to know more about "psychotic thinking," specific case histories, special techniques for dealing with certain kinds of patients, and so on. In view of this great expression of interest in psychology, it is likely that educational efforts conducted in this setting would be quite effective.

Probably the greatest problem for the future will be resisting "institutionalization" of the camp itself. It is clear that medical experts, larger professional staff, and permanent buildings and equipment are thought to be the natural characteristics of a second generation program. This trend is encouraged by the occasional occurrence of medical problems—for example, drug overdoses taken by patients who conceal and collect pills. Recently proposed solutions include stricter regimentation and supervision of patients, which would obviously run counter to the camp's treatment objectives, and additional medical staff members, which would further suggest the medical atmosphere of the mental hospital.

The familiar "person-tactical" problems which attend any such novel treatment program were evident in the first camping season. Aides and other hospital personnel who accompanied patients to camp complained that the Service Corps students rejected or ignored them, placing no value on their suggestions, even though some of these professionals were much more familiar with the patients than were the students. Educational barriers and conflicting loyalties led to considerable misunderstanding. More carefully planned, direct communication would have alleviated these problems.

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[8] Wiseman's report, by permission.

As the camp becomes better established and more developed, fewer work opportunities will present themselves. If the camp is to maintain its effectiveness, new ways must be conceived to interest patients and involve them in activities. As permanent dwellings are added, great care will be required to discourage the natural equation of wards and cabins, day room and recreation hall. A picture of 50 patients sitting complacently in cabins, dining hall, and recreation hall is not difficult to imagine. The goal of getting chronic patients out of the institution and into an active environment could end with institutionalization of the camp.[9]

G. DISCUSSION AND CONCLUSION

The theoretical ideas presented earlier in this paper were developed quite independently of the camping program just described. Both developments are evidence of important changes that are taking place currently on conceptual and practical levels to transform the problem of mental illness into some other kind of problem, for which, hopefully, a more adequate solution can be found.

In presenting the elements of a particular transformation of the problem of mental illness together with a description of the Service Corps camping program, it may seem that we have gained no evidence for the value of the transformation. Few of the patients "got well." Many probably will not be lastingly affected by the camping program.

Yet, our interpretation is that we have obtained good evidence for the viability of the approach here discussed and illustrated. At a minimum we have succeeded in demonstrating the possibility of a nonpatient sort of life for chronic patients complemented by nonprofessional staff. Moreover, it was agreed by all who attended the camp that the time spent there was redeemed. It was not dead time or inmate time; it was a worthwhile human experience. The uniform positive reactions of psychiatrists to the returning patient-campers is a very encouraging note.

There are several signs that the camping program described in this article may develop toward the ends of patient responsibility[10] and community acceptance and respect[11] rather than toward the end of becoming a fresh air mental hospital.

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[9] In the summer of 1966 the camp enjoyed another successful season. Several new permanent buildings were added to the site, and waterfront and dining facilities were substantially improved. Plans are progressing for still more expansion and development of the program for the summer of 1967 and ensuing years.

[10] For the 1966 season one of the male campers who enjoyed doing landscape work in 1965 came back to the camp as a staff member. All winter he collected and raised plants to ornament a small central plaza named in his honor last year. Quite conceivably this kind of patient involvement could be expanded each year, until a significant percentage of the camp staff is made up of patients. For example, one of the female campers spent part of the winter season in the hospital learning to be a swimming instructor.

A further possibility for which some hope is warranted is that the students who participate in this and similar programs will provide an informed and dedicated force for establishing similar programs in other places.

Finally, the camp program demonstrated, for a fairly representative sample of mental patients, that they are at least transiently responsive to attempts to restore their lost identities. Patients appreciated being listened to and attended to. They appreciated being socially recognized for commendable performances. The real prospect for the future is that a means might be devised, perhaps as an extension of present volunteer programs, for the more permanent social rebuilding and promotion of those who are presently called mentally ill. It might be suggested that psychologists stop asking for a cure for mental illness. Instead, let psychologists ask how it might be possible to transform degraded social identities. The camping program described here may be a prototype for the answer to this question.

H. SUMMARY

Drawing upon present controversies regarding the utility of the "mental illness" concept, a view is presented that mental patients might be regarded as individuals with degraded social identities. A camping program for chronic mental patients is described as an application of this conception. Camper-patients become highly involved in real, functional roles and at the same time become disinvolved from subordinate and dehumanizing positions within the mental hospital. In terms of immediate effects on patients and students, the program was highly successful.

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[11] In the process of building and operating the camp during its first season, a number of community organizations contributed their efforts. Local churches accepted patients into Sunday services, Boy Scout groups aided in clearing the campsite and locating tents, local women's groups provided home-cooked meals on Sunday evenings, and a local high school loaned out its kitchen, athletic fields, and a bus. Patients and staff attended a local summer block dance. The camp director made himself available for lectures and discussions with interested service groups in the neighborhood, and visits to the camp were encouraged.

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SOME EFFECTS OF VERBAL CONDITIONING ON PREFERENCE BEHAVIOR*

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A. Introduction

A number of recently published studies indicate that the events of verbal conditioning follow closely the parameters delineated for operant conditioning. Eisman (3), studying the development of a color preference response (positive attitude) through mediated generalization, found a color response of the type predicted could be generated. Krapustnik (4) demonstrated that salivary reactions conditioned to verbal signs representing auditory and visual stimuli transferred to those stimuli themselves. Osgood and Suci (8) proposed that if weak and passive factors are conditioned to a label, greater nonpreference behavior would result toward that label. Doob (2) placed the idea of attitude within the framework of behavior theory and felt attitude was a learned response to definable stimuli. Cofer and Foley (1), Mowrer (5), and Osgood (7, 8) view meaning as a response. In a series of studies, Staats and colleagues (11, 12) and Staats (9) showed that meaning to verbal stimuli could be conditioned.

Ziskin's (13) unpublished dissertation demonstrated that a label with positive affect will tend to increase *S*'s preference for that label, but failed to demonstrate that a negative label would result in nonpreference or avoidance behavior. His study dealt with sign-to-object generalization as it is related to nonverbal (preference) behavior. He conditioned adult *S*s to words of positive and negative meaning and explored the effects on nonverbal or preference behavior of *S*s toward objects represented by words loaded with positive and negative meaning. He hypothesized that verbal manipulation of the meaning of verbal labels could modify the nonverbal behavior toward the object signified by the label. That voluntary, nonverbal behavior toward an object could be changed by altering the meaning of the label which represents the object was demonstrated. He concluded that preference behavior existed for blocks (the objects conditioned to the verbal labels) whose labels were of a positive evaluative nature, but blocks whose names had been conditioned for negative meaning did not show any significant avoidance pattern.

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It was primarily Ziskin's work which led the authors to try, using quite different methods, to investigate some effects of verbal conditioning on preference behavior. Basically the authors were interested in the question: "Can preference behavior toward a labeled object be changed by altering the meaning of the verbal label that represents the object?" The authors hypothesized the following:

1. A labeled object will acquire an unpleasant affect when negative and weak associative meaning is conditioned to it.

2. A labeled object will acquire a pleasant affect when positive and strong associative meaning is conditioned to it.

3. Preference behavior for a labeled object will be a function of the degree of affectivity of the labeled object: i.e., conditioning negative meaning to a label will result in less than a chance selection of the labeled object, while conditioning a positive meaning component to an object will result in a greater than chance selection or preference for the object.

B. METHOD

*S*s were 96 students from introductory psychology classes. Materials consisted of (*a*) nonsense syllable-word pairings (in slide form) adopted from Staats and Staats (10), (*b*) nonsense syllable-(sketched) block-pairings in slide form adopted from Ziskin, and (*c*) semantic differential and "block-differential" scales.

*S*s were told that this was a study on how rapidly people learn and were encouraged to do their best to learn the material that would be presented to them. They were all first handed a preliminary rating and instruction sheet which contained several nonsense syllables and block patterns and told to rate them as to how pleasant or unpleasant they thought they were. *E* encouraged *S*s to ask any questions before the experiment got underway, and also demonstrated a typical rating procedure.

Five different nonsense syllables and five block patterns were used in the experiment. YOF was first paired with block pattern number 2 (BP2) and then paired with words of a negative, unpleasant evaluative dimension. WUH was first paired with block pattern number 1 (BP1) and then paired with words of a positive evaluative meaning component. The remaining nonsense syllables were paired with the remainder of blocks and, subsequently, with words of a neutral evaluative meaning component.

After *S*s had originally rated the block patterns and nonsense syllables, they were told to circle their favorite pattern and cross out the one they most disliked. Rating sheets were then collected, and *S*s were shown the nonsense syllable-block pairings on a screen; the exposure of each slide was eight seconds. Each slide was duplicated 10 times so each nonsense syllable block pairing (NS-BP) was viewed 10 times for a total of 80 seconds. Slides were arranged in random order with the stipulation that no particular nonsense syllable-block pattern would be seen more than twice in succession. After the presentation, *S*s were given a second form on which were printed the five NS they had just viewed; beside the NS was a block periphery or outline, the inside of which was vacant. *S*s were told to fill in the pattern that corresponds to the NS. Those unable to duplicate the block patterns were not considered as having learned the NS-BP pairings and were not figured in the results. This left a remainder of 82 *S*s.

After duplicating the NS-BP pairings, *S*s were shown five nonsense syllables each paired with different words. Slides were exposed for eight seconds and in a random order, with the stipulation that no particular nonsense syllable-word pairing would be shown more than three times in succession. A total of 80 slides were shown. Rating sheets were then distributed and *S*s were asked to re-evaluate the nonsense syllables and block patterns, to circle their favorite block pattern, and to cross out the block pattern they most disliked.

C. DESIGN

The binomial sign test was used to analyze the data from 82 *S*s. (Of the original 96 *S*s, 14 were unable to duplicate the NS-BP pairings.) If *S*s considered the block patterns or nonsense syllables they rated at the conclusion of the experiment as more pleasant than when they had originally rated them, a positive (+) shift in the rating should occur (i.e., a shift toward the pleasant side of the continuum). Likewise, a more unpleasant attitude or preference for a nonsense syllable or block pattern should result in a negative (—) shift in the rating toward the unpleasant end of the continuum. Ratings that did not change were handled in such a way that half fell into the positive shift and half into the negative. It was assumed that the probability of a "+" shift was .5, and similarly for a "—" shift.

D. RESULTS

Results are treated at the $p = .05$ level of significance. Figure 1 indicates the rating shifts of the conditioned stimulus (CS) words. Figure 2 portrays the rating shifts of the block patterns. Figure 3 represents the block preference indications over the course of the experiment.

YOF	+ 18	- 64	*S	--- conditioned negative meaning
QUG	+ 51	- 31	S	--- conditioned "neutral" meaning
LAJ	+ 46	- 36	**NS	--- conditioned neutral meaning
WUH	+ 68	- 14	S	--- conditioned positive meaning
GIW	+ 45	- 37	NS	--- conditioned neutral meaning

n=82

*Significant

**Not significant

FIGURE 1
Rating Shifts of CS Words Relative to First Rating

Analysis of the data indicates that the conditioning effect hypothesized did in fact occur. The conditioning of negative evaluative meaning to previously neutral nonsense syllables can be a factor in the establishment of nonpreference

Block Pattern (BP) # 1	+ 63	- 19	S	--- paired with WUH
BP # 2	+ 21	- 61	S	--- paired with YOF
BP # 3	+ 44	- 38	NS	--- paired with GIW
BP # 4	+ 37	- 45	NS	--- paired with QUG
BP # 5	+ 47	- 35	NS	--- paired with LAJ

n = 82

FIGURE 2
Rating Shifts of Block Patterns Relative to First Rating

First Presentation - Most Preferred

BP # 1	F = 16	NS	P	.05
BP # 2	F = 19	NS	P	.05
BP # 3	F = 17	NS	P	.05
BP # 4	F = 14	NS	P	.05
BP # 5	F = 16	NS	P	.05
	n = 82			

First Presentation - Least Preferred

BP # 1	F = 15	NS	P	.05
BP # 2	F = 15	NS	P	.05
BP # 3	F = 17	NS	P	.05
BP # 4	F = 19	NS	P	.05
BP # 5	F = 16	NS	P	.05
	n = 82			

Second Presentation - Most Preferred

BP # 1	F = 56	S	P	.05
BP # 2	F = 5	S	P	.05
BP # 3	F = 5	S	P	.05
BP # 4	F = 4	S	P	.05
BP # 5	F = 12	NS	P	.05
	n = 82			

Second Presentation - Least Preferred

BP # 1	F = 0	S	P	.05
BP # 2	F = 13	NS	P	.05
BP # 3	F = 44	S	P	.05
BP # 4	F = 18	NS	P	.05
BP # 5	F = 7	S	P	.05
	n = 82			

Hypothesis - $P \neq .2$

FIGURE 3
BLOCK PATTERN PREFERENCE FREQUENCIES

behavior toward objects signified by the conditioned labels. It also appears that conditioning of positive evaluative meaning to previously neutral nonsense syllables results in a greater than chance selection or preference for objects signified by the conditioned syllables. The findings of Ziskin (13) and Staats and Staats (10) agree with the results found here.

By far the greater preference was shown for the block pattern corresponding to the "pleasantly conditioned" nonsense syllable WUH. No *S*s voiced a preference for the block pattern corresponding to YOF, the nonsense syllable "unpleasantly conditioned." By chance the preference for any one of the blocks should not exceed $p = .2$.

E. DISCUSSION

That evaluative responses can be conditioned to contiguously presented nonsense syllables was demonstrated. YOF, a nonsense syllable originally eliciting a neutral response, assumed a significant shift when paired with words of a negative evaluative category. WUH, originally neutral, assumed a positive shift when paired with words of a positive evaluative nature. More significant is the shift in evaluation of previously neutral block patterns.

The second order conditioning involved was strong enough to effect a change in the predicted direction of block patterns paired with the different nonsense syllables. The pattern paired with YOF was not preferred by any *S*. Alternatively, the pattern paired with WUH was preferred by more *S*s than all other patterns combined. The hypothesis that conditioning negative and weak associative meaning to a nonsense syllable will result in an unpleasant affect toward that nonsense syllable is upheld here. This conditioning also results in nonpreference behavior toward objects associated with their negative verbal-visual counterparts. Also supported here is the hypothesis that a nonsense syllable and an object (block pattern) associated with it will acquire a pleasant affect when positive and strong associative meaning is conditioned to the nonsense syllable alone. It seems that preference behavior for a labeled object will be a function of the degree of affectivity of the labeled object, which is itself a function of the affectivity of the label (conditioned syllable) that represents the object. Results here show that conditioning negative meaning to a label will result in less than a chance selection (preference) of the object represented by the label. Conditioning a positive meaning component to a label will result in a greater than chance selection of an object represented by the label. Mowrer (5) postulated that word meaning can be conditioned to contiguously presented stimuli. Evidence in this study confirms his idea. Mowrer also suggested that a sentence can act as a conditioning device, and that communication will occur when the meaning response brought out by the predicate of the sentence is conditioned to the subject. From this idea one might conclude that meaning is a mediating response. Again results here support such an idea.

The study does contain an anomaly. Figure 1 indicates the nonsense syllable QUG assumed a significant shift towards the pleasant end of the continuum on its second rating by *S*s. Perhaps one or more of the UCS words paired with QUG were "loaded" in a sense, and this was not determined in the original study by Staats and Staats (11). The study in its entirety indicates that preference behavior toward labeled objects can be effectively manipulated by pairing labels representing the objects with words of positive, negative, or neutral evaluative dimensions.

F. SUMMARY

The hypothesis that word meaning will condition to contiguously presented stimuli was tested and confirmed. Secondly, the hypothesis that objects paired with conditioned labels will themselves be conditioned in the same direction as the conditioned labels was tested and confirmed. The degree of preference for the labeled objects was found to be a function of the conditioning or evaluative makeup of labels representing the objects.

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SUICIDE AS AN AGGRESSIVE ACT*

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A. INTRODUCTION

It seems intuitively likely that suicidal behavior is an act of inward-directed aggression. This is the position that Freud (6) took and, more recently, it has been the fundamental assumption of Henry and Short (8), who proposed a theory of suicide as a reaction to stress that depends on the external restraints on the individual.

Hitherto, there have been few studies that have investigated whether, in fact, suicidal persons differ from nonsuicidal persons on other measures of aggression. Studies of intropunition and extrapunition in suicidal persons have produced inconsistent results. Winfield and Sparer (10) reported that suicidal persons were less extrapunitive than controls, Farberow (4) reported that they were more extrapunitive than controls, but Fisher and Hinds (5) and Vinoda (9) reported no differences.

The present study uses a nonhospitalized population to investigate the aggressive tendencies of the suicidal person. Aggression was measured with the Buss and Durkee (2) hostility scale, since this scale provides measures of eight different types of hostility and, therefore, a more complete picture of the aggressive tendencies of individuals than techniques that assess only extrapunition and intropunition.

B. METHOD

The subjects were 43 undergraduates from an introductory course in psychology. They were told that the study was concerned with the relationship between childhood experiences and attitudes toward death and suicide and that participation was voluntary. Each subject filled out a questionnaire which took about one hour to complete. Each student was given a code number to identify his questionnaire. Thus, although the experimenter was able to identify a questionnaire if it became necessary, the subjects were given some degree of anonymity.

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Three parts of the questionnaire are relevant here. Each student was asked whether he had ever discussed the topic of suicide intellectually, thought of suicide in relation to himself, threatened to anyone that he might commit suicide, or attempted suicide. Since it was considered possibly harmful to question subjects further about their suicidal behavior in a nontherapeutic situation, each student completed the Devries (3) suicide potential scale which has been found to differentiate between suicidal and nonsuicidal psychiatric patients. This provided additional evidence as to the suicidal tendencies of the subjects not dependent upon self-report. Finally, each subject completed the Buss and Durkee hostility inventory. This has eight subscales: assault, indirect hostility, irritability, negativism, guilt, resentment, suspicion, and verbal hostility.

C. Results

Of the 43 subjects, five had attempted suicide, five had threatened suicide, 19 had considered suicide, and 14 had never considered suicide. The mean ages of the groups were 17.8, 18.2, 18.2, and 18.4 years respectively.

The mean score of the attempted and threatened suicides on the suicide potential scale was 5.5, of the considered suicides 3.7, and of the nonsuicidal group 2.6. The groups differed significantly on a one-way analysis of variance ($F = 9.8$, $df = 2/39$, $p < .01$). The attempted and threatened suicides did not differ significantly ($t = .58$, $df = 8$).

Only two subscales of the hostility inventory differentiated significantly between the suicidal and nonsuicidal groups. The attempted and threatened suicides showed most resentment and the nonsuicidal group least resentment ($F = 6.9$, $df = 2/39$, $p < .01$) and the attempted and threatened suicides showed most irritability and the nonsuicidal group least irritability ($F = 4.1$, $df = 2/39$, $p < .05$). The other scales produced nonsignificant differences (all F values < 2.1). The five threatened suicides scored higher than the five attempted suicides on all eight subscales, which is a significant difference on a binomial test ($p = .004$).

The suicide potential scale was correlated with the subscales of the hostility inventory and again only the resentment and irritability subscales produced significant correlations. The product-moment correlation between the resentment scale and the suicide potential scale was .31 ($p < .05$) and between the irritability scale and the suicide potential scale .27 ($p < .10$). All other correlation coefficients were less than .20.

D. Discussion

Several important points have emerged from this study. The rate of attempted suicide in students can be estimated as 1160 per 10,000. This is probably an overestimate, since the population was one volunteering for a study on death attitudes and enrolled in a psychology course.

The results cross-validate the suicide potential scale of Devries in a very different population from that used to construct the scale.

With regard to the main issue, the scales concerned with the manner and direction of expressed aggression did not differentiate the groups. The irritability and resentment scales did differentiate the suicidal subjects from the nonsuicidal subjects. This fits in with the general clinical picture recorded for adolescent attempted suicides. The irritability scale includes the notion of impulsivity and this factor has been noted in adolescent attempted suicides (7). High resentment has also been reported (1). Whether these results would be obtained in a suicidal population of adults can only be answered by further investigation.

Although the sample was small, the threatened suicides scored higher on all scales than the attempted suicides. They appear to be more aggressive and hostile persons and this accords well with Farberow's conclusion (4). This difference could be present in the premorbid personality or stem from the well-documented cathartic effect of the suicide attempt (4).

In conclusion, the present study failed to support the idea that suicide can be regarded as an example of a general tendency to inhibit aggression or turn it inward onto the self. Therefore, theories that are based on this assumption must be regarded as resting on untrustworthy foundations.

E. Summary

Students answered questions about their suicidal behavior and completed a suicide potential scale and an hostility inventory. Those who had attempted or threatened suicide did not differ from nonsuicidal subjects in the manner and direction of expressing aggression. Suicidal subjects were more irritable and had more resentment than the nonsuicidal subjects. This agrees with the clinical picture of adolescent attempted suicides. These results do not support theories of suicide which view suicidal behavior as an act of inward-directed aggression.

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AN EYE-MOVEMENT INDICATOR OF INDIVIDUAL DIFFERENCES IN THE PHYSIOLOGICAL ORGANIZATION OF ATTENTIONAL PROCESSES AND ANXIETY*

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A. INTRODUCTION

The writer has previously reported (3) a visually observable eye-movement phenomenon of shifting attention which occurs during dyadic verbal communication. The movement appears to be universal in man after verbal fluency is attained. The direction of the movement separates individuals into two groups ("left-mover" and "right-mover"). Polar differences in perceptual and cognitive styles seem particularly observable clinically in style of language used to describe affective states. The differences seem best conceptualized as individual differences in the temporal distribution of attention. The right-mover describes anxiety as having external locus and a "fear in search of an object" quality. His description seems similar to the clinically descriptive label of "diffuse" anxiety. The left-mover describes anxiety as having definite internal locus. The quality is one of tension, arousal, and "loss of control of impulses." His description approximates the clinical label for "manifest" or "tensional" anxiety. On observation, approximately 70 per cent of married couples show opposite directions of the eye movement. These and other clinically observable differences are reported elsewhere (4). The phenomenon is exceedingly interesting in its relation to verbal processes in dyadic communication behavior. The existence of the phenomenon has been experimentally confirmed by Duke (5). He found the phenomenon relatively reliable in direction and characteristic of the individual. He strongly shows its association with reflective thought processes and its lack of association with sex, handedness, and eye dominance factors.

The present paper is concerned with describing some physiological differences in the right-mover and left-mover which appear in electrophysiological reactivity patterns during the same simple sensori-motor reaction time behaviors. A high speed recording technique is described in which electrooculographic

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and electroencephalographic activity is simultaneously obtained. The findings seem provocatively interesting ones to our conceptions of how attentional processes are organized. The movement implicates frontal lobe centers which are lately evolved. Animals below the crocodiles have lateral eyes and must turn their heads in order to turn their eyes laterally. These centers—Brodman, area 8 (11)— are active in the rapid eye-movement stage of sleep associated with dreaming, are in close proximity to centers implicated in expressive speech and in fine, volitional prehension behaviors. They are close to the areas invaded surgically in lobotomy procedures.

B. The Phenomenon

The movement may be visually observed in the following manner. Obtain the visual attention of another person as evidenced by head orientation and eye fixation. Ask a question which requires reflective thought while observing the person's right eye. A nasalward (left) or temporalward (right) movement will be observed. The subject apparently breaks visual fixation momentarily as he shifts attention from a passive listening mode to an active expressive mode.

That the movement seems related to an "internal-external" dimension of attentional process seems indicated by the following. Have a subject visually fixate his own palm or some object at near reading distance. Have the subject mentally ask himself such a question and mentally answer himself. The eye movement will be observed to occur in an opposite direction to that observed in the dyadic interpersonal context.

That the movement seems related to level of anxiety is indicated by its absence when an affectively embarrassing question is asked in normals. In neuropsychiatric patients the movement is often absent to visual observation or increased in velocity and decreased in extent.

C. Procedures

Subjects were visually classified as right- or left-mover before electroencephalographic (EEG) and electrooculographic records were made in the following manner.

DC electrooculography was obtained using a triangular electrode placement at inner canthus, outer canthus, and upper-mid orbit. Five channels of EEG could be recorded, leaving Channels 7 and 8 (see Figure 1) available for stimulus and response marker keys. Leads 1, 5, 11, 13, and 17 (all left side) were found to be most informative. Unipolar electrodes were used with the ipsilateral ear serving as reference. An eight channel Offner Dynagraph, Type R, made records at 250 millimeters per second paper speed. While the equipment condition and electrode placement are critical at this high speed of operation, records could be obtained with care and patience. The Offner pens were found to follow faithfully known imposed (signal generator) frequencies to 150 cps at this recording speed.[1]

Subjects were recorded while sitting erect, with eyes open, and while engaged in simple auditory and visual reaction time tasks. For these, a short light flash or a short sound stimulus was presented from a mid-overhead position. The subject was informed whether a series of auditory reaction times or visual reaction times was to be taken. He was instructed to press a marker button (held in his hand) as soon as he saw or heard the stimulus. Records were also obtained of voluntary and involuntary eye movement and blinking.

D. RESULTS

The records of four subjects are presented here for illustrative purposes combined into one figure. The four subjects are chosen for prominent display of the individual differences between right- and left-mover found consistently in all cases. In all figures the same subjects and lead array are maintained as follows.

Subject A was a normal, female, hospital employee, and a left-mover on the eye phenomenon. Subject B was a normal, female, hospital employee and a right-mover on the eye phenomenon. Subject C was a male, left-mover, paranoid schizophrenic with active symptoms of passive, autistic delusions regarding his "faith healing" powers. Subject D was a male, right-mover, paranoid schizophrenic with reactive, suspicious delusions regarding ideas of reference about homosexuality.

Figure 1 shows records obtained from Subjects A, B, C, and D at two speeds of recording for comparison purposes. The usual clinical EEG speed (25 millimeters per second) may be compared with the character of high speed (250 millimeters per second) records obtained from the same four subjects. Several differences between left-movers A and C and right-movers B and D may be noted. The passive nystagmus of the eye may be easily observed and counted for frequency in left-movers only. Note the relatively lower amplitude and higher frequency in the records of right-movers B and D. The channel numbers refer to EEG leads. The first channel (marked L/E) is the oculographic record of the subject's left eye.

Figure 2 shows the same four subjects in a simple auditory reaction time

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[1] The writer is indebted to Mr. Archie C. Moorehead and Mr. Theodore Bond of the Clinical Sciences Laboratory for their technical help in obtaining these records.

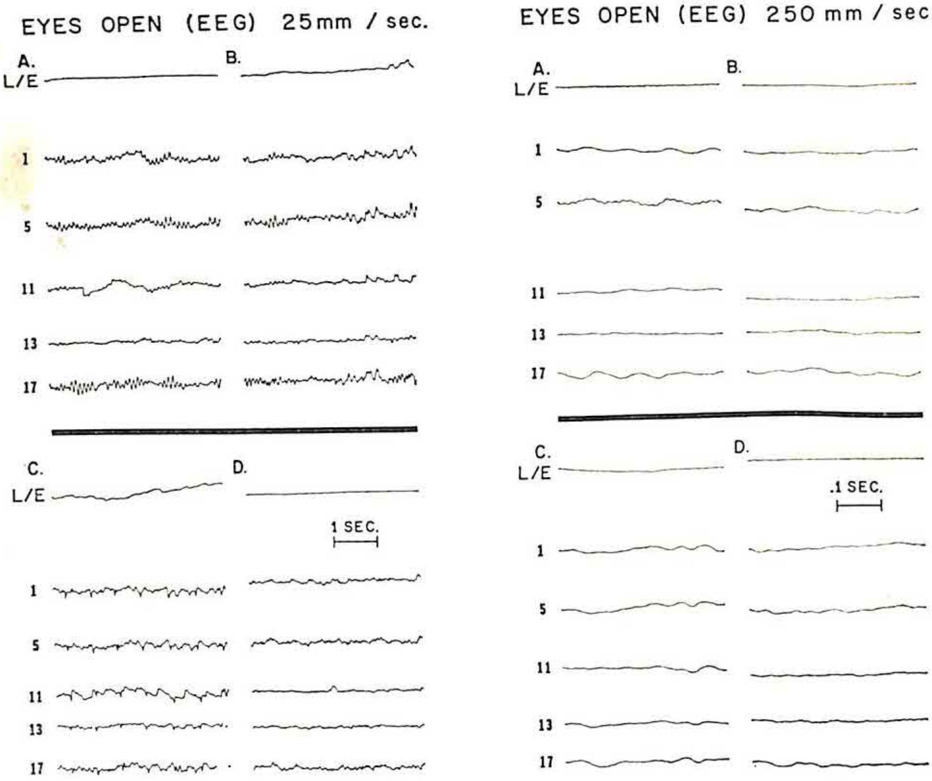

FIGURE 1
A COMPARISON OF 25 MM PER SECOND AND 250 MM PER SECOND
RECORDING SPEEDS FOR SUBJECTS A, B, C, D

task. The duration of the sound stimulus (about 700 milliseconds) may be observed. The subjects' reaction time may be observed on the marker key channel. Note the reflex like, left eye movement which occurs in the left-movers (Subjects A and C) at the onset of sound stimulation. Note the absence of this reflex movement in the right-mover records (Subjects B and D). This finding was consistently obtained in all records. That the left-mover's eye movement is reflex like is indicated by its short latency (less than 10 milliseconds) and its short duration (50-100 milliseconds). The regular activity in the EEG channels of Subject C is a heart spike being picked up at the head. This was often seen in records of pathologically anxious left-movers and was never observed in the record of a right-mover patient or normal.

Figure 3 shows the same four subjects in a visual reaction time task. The duration of the light may be seen in the light stimulus channel. Note that the

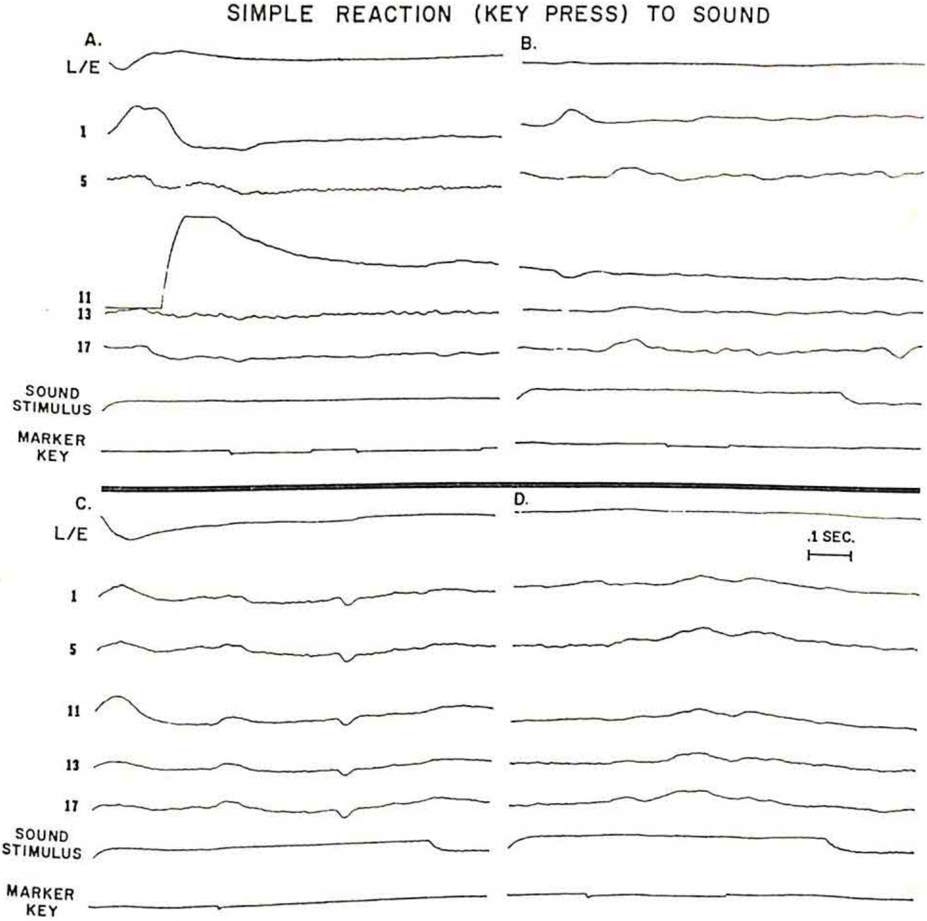

FIGURE 2
SUBJECTS A, B, C, D RECORDED DURING A SIMPLE AUDITORY REACTION

reflex eye movement shown to the sound stimulus is now absent in the records of the left-movers. Instead all subjects show a small right eye movement of volitional character and latency (about 50-100 milliseconds). Other differences may be observed. Note the extreme differences in waveform of involuntary blink in Subjects A and D. Subject C shows a large pattern of activity in all EEG leads following his termination of key press. Many pathologically anxious left-movers showed this activity following key press.

Differences in cerebral activity of eye blink and voluntary eye movement were also observed (not illustrated). Voluntary eye movement (subject asked

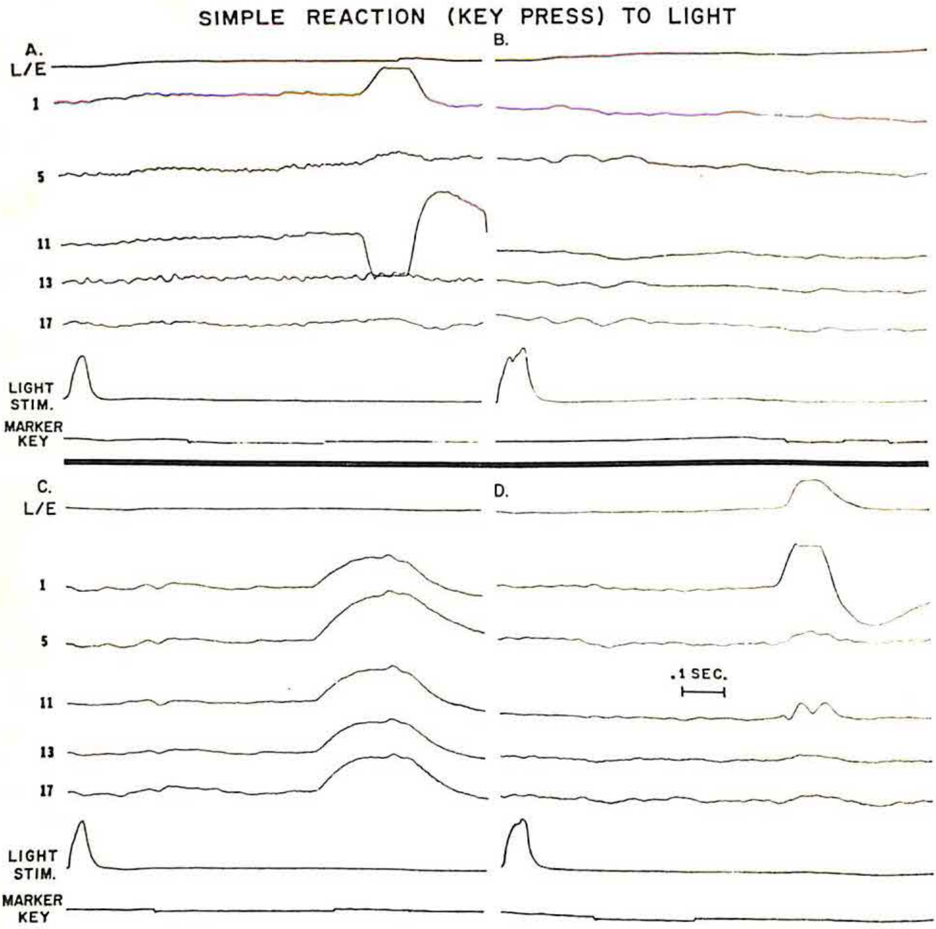

FIGURE 3
Subjects A, B, C, D Recorded During a Simple Visual Reaction

to move his eyes to the right or left on command) resulted in activity which appeared to initiate and be recorded most strongly in Frontal Lobe Lead 1, in all subjects.

Passive following eye movement (following a finger moved horizontally) resulted in smooth sinusoidal activity in all subjects, which appeared initiated and most strongly recorded in Temporal Lead 11 in all subjects.

E. Discussion

While quantitative analyses of wave frequency and amplitude have not been performed, the records strongly indicate the following:

1. Left-mover and right-mover show differences in general pattern of high speed EEG records. The left-movers show greater amplitude and lower frequency of general activity than right-movers.
2. Left-mover and right-mover differ sharply in reflex eye movement reactivity to the same simple auditory reaction time task.
3. Patterns of organization of voluntary eye blink seem to take grossly different forms in left-mover and right-mover.
4. Passive following eye movement seems differently organized and initiated than the same horizontal eye movement executed on command.

If subjects differ systematically in response to the same simple sensorimotor stimulus sequence and further if the same movement differs in cerebral pattern depending on whether attention is externalized or internalized, then this eye-movement phenomenon appears critically important in conceptualizing selective attentional processes on both the physiological and psychological levels. It raises questions for selective attention which may be used to extend a Pavlovian type view of inhibitory or excitatory functions.

The equipment used here is less than ideal for the purpose. Tape recorded EEG and EOG with time phase control of stimulus duration and onset would be more appropriate than the method used and would permit mechanical statistical analysis. The procedure differs sharply from usual clinical usage. EEG is usually recorded from a reclining subject who is instructed to close his eyes and to be as inactive as possible. The equipment is usually filtered to reject high frequency activity and only alpha is recorded with fidelity. Such procedure seems clearly inadequate to capture the events of an active attending brain. It is hoped that this paper will stimulate interest in both the individual differences shown by left-mover and right-mover, and the further definition of events occurring in simple attentional behavior.

F. IMPLICATIONS

The finding of an individual difference that dichotomizes the population and suggests differences in both physiological and psychological organization of anxiety and simple selective attentional behaviors seems worthy of fuller investigation with better facilities than those available to the writer. The findings seem best conceptualized as indicating characteristic individual differences in the temporal distribution of attentional processes over time.

The suggestion is strong that clinically observable differences in quality of anxiety have regularly occurring physiological correlates when the population is divided into right- and left-movers. It appears likely that empirical physiological measures of quality and level of anxiety may be within reach.

The importance of these for both psychotherapeutic and chemotherapeutic intervention in functional anxiety seems obvious. A fuller discussion of clinical correlates of the phenomenon than the present paper is being published separately (4).

There has been much recent interest in the obviously disturbed simple perceptual and psychomotor functions of schizophrenics. Silverman (12) and Eysenck (7) provide particularly useful reviews. If a general population difference of attentional process exists then the epileptic and psychosomatic syndromes, as well as the schizophrenic syndromes, may also receive better definition than are presently given.

Quite aside from clinical application, the phenomenon suggests a theoretical view of how selective attentional processes may be organized, which differs sharply from our present physiological views in two important respects. It would make time the base for the measurement of behavior and would make the separation of recordable events directly related to the intrinsic rhythms of the brain itself.

Figure 4 shows an abstract conceptualization of two nonlinear frequencies in 45:10 or 9/2 ratio. It would attempt to relate sensori and motor events to particular points in time, and would particularly identify vision and audition as occupying disparate positions in time. The model is a geometric one dependent on four dimensions: The time base (in this case 200 milliseconds) is chosen because of the systematically longer visual reaction time (about 200 milliseconds) when compared to auditory reaction time (about 150 milliseconds). The two frequencies are the alpha rhythm (10 cps), which appears to be the major frequency of the resting or inactive brain, and the beta rhythm (45 cps). The 45 cps frequency for beta has been chosen because of the intriguing relations of this frequency with the motor phenomena of vision, of conscious volitional behavior, and its association with frontal lobe centers. Beta and alpha may be represented by central angles; and, because they are nonlinear and similar to Π and *e* in quality, the amount of phase shift between them is of critical theoretical importance. Data will be presented that make plausible the inference of a phase shift ranging from about 25 milliseconds (alpha/4 or 8/7 beta) to about 50/9 milliseconds (alpha/18 or beta/4). The supportive evidence follows.

Wiener (18) has already developed the general notion and proposed the view that the activity of the brain could be summatively viewed as the activity of a finite number of nonlinear oscillators. He provides mathematical approaches to such conceptions. This model proposes only two such oscillators with vision and hearing postulated as occupying disparate time segments of the sensory activity.

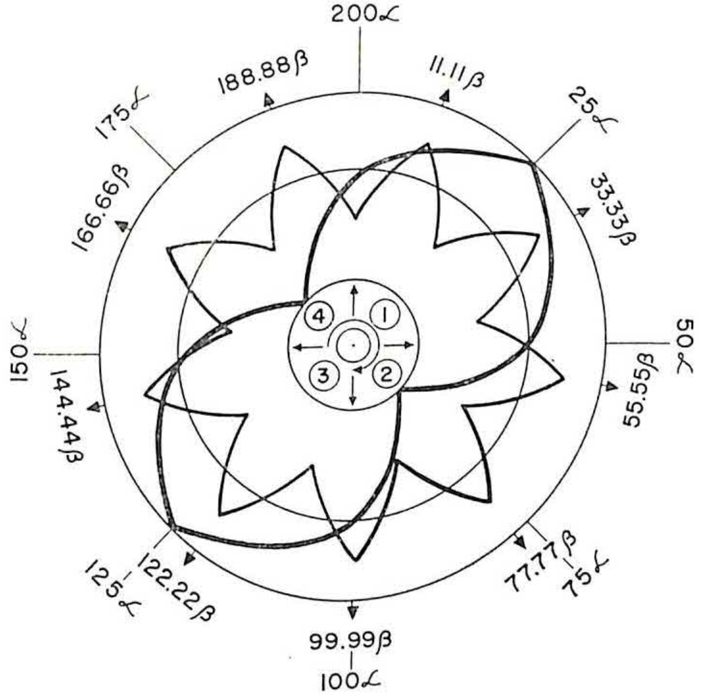

FIGURE 4
SCHEMATIC REPRESENTATION OF A TWO OSCILLATOR MODEL OF SENSORI-MOTOR ATTENTION

There is much data to support the view that vision and audition occupy separate time channels and that the brain acts as a single channel instrument in apprehending brief sensory stimulus changes. Travers (15) provides data to support this view strongly and shows switching time of attention to be on the order of 200 milliseconds when switching from visual to auditory (and *vice versa*) apprehension of verbal material.

If we assume that vision and audition are mere inverses of each other in time, then a wide range of sensori-motor phenomena may be organized into geometric pattern.

The eye itself oscillates (passive nystagmus) at about 40-60 cycles per second. This approximates the frequency at which the phi phenomenon occurs in the visual systems of animals as well as men. This frequency also approximates that of fatigued striped muscle.

If EEG activity is used as a parameter, the Bartley and Talbot brightness effects are at alpha frequency, while perceptual "seeing" is firmly related to the 45 cps level of the visual apparatus. We do not see when eye movement exceeds certain angular velocities, as when shifting our gaze, or when the passive nystagmus is stabilized either by target counter movement or by drugs abolishing the nystagmus. Consciousness itself depends on asynchronous beta activity (above 30 cps). Rapid horizontal eye movement occurs in dream-state light sleep, when general striped muscle tonus is at even lower levels than in deep sleep. The above data are reviewed generally at different levels by Brazier (1); Ellingson (6); Lindsley (9, 10); and Field, Magoun, and Hall (8).

Many motor phenomena seem to be accommodated by the model. Livingstone showed (14) that electrical stimulation of frontal eye fields in apes produced left movement at alpha-frequency and right movement at beta-frequency stimulation of the *same* site. The data on reaction time Woodworth (19) and Stevens (13) reveals that repetitive movement, such as tapping or tip of tongue movement, occurs at approximately alpha frequency. There have been claims by Bates and others (16) that voluntary movement occurs at specific points (approximately 150 milliseconds from zero) when the alpha wave is used as a time reference. Highly skilled volitional movement, as in typing or playing musical instruments, occurs at maximal rates of half-beta frequency. These movements are maintained only through practice and are executed in groups rather than individually. As each movement consists actually of two movements (extension and flexion), then normal, nonpracticed volitional movement occurs at a rate of two alpha, while skilled movement occurs at a limit of beta frequency.

Research has been done on the phase entry relationship between stimulus and the alpha rhythm of the brain. The alpha/4 relationship for the visual stimulus phase entry shown by Bartley was not found in audition by Calloway (2). His numerical data, however, strongly suggest that the phase entry relation for audition is simply beta/2. Weiss (17) provides clear demonstration that the lengthened reaction time of aged subjects is entirely due to lengthened premotor integration time, while the motor component of reaction time remains stable.

Space does not permit a detailed review of the voluminous literature associating the frequency pattern of EEG with levels of consciousness, sleep, dreaming, and specific sensori-motor sequences as in conditioning. In general, the relation between beta activity and higher levels of consciousness seems clear. There is direct evidence by Ellingson (6) that alpha frequency matures at about age 2 to 3, while beta frequency shows continued developmental and maturational change to as late as 8 or 10. The eye phenomenon has not been observed in children below age 4 or in those mentally retarded who lack verbal facility. The suggestion seems clear that the organization of cerebellar-hypothalamic and frontal lobe structures may be a reciprocal one to that of the better known reticular ascending system. Such a conception implies dual organization and mass action in even the simplest sensori-motor behavior involving the cortex.

Finally, attention seems a peculiarly psychological concept without analogue in the sciences dealing with nonliving subject matter. Before the wide acceptance of the relatively monistic and reductionistic metapsychologies of behaviorism and psychoanalytic theory, attention was once the central issue of psychology. Because of the general relationships that may exist between the physiological patterns and the higher processes of language and communication behaviors and those of functional anxiety, the presentation of these preliminary findings and speculative conclusions seems justified. The physiological and psychological differences shown by right- and left-movers seem to present polar dimensions which are provocatively fundamental. The physiological differences shown in the same sensori-motor sequence clearly suggest the need for a dualistic model of attentional processes. While the present recording technique is admittedly unconventional and not ideal for the purpose, the procedure does permit a fuller examination of the pattern of events occurring within simple sensori-motor sequence than is usually afforded by electroencephalography.

It seems likely that the eye phenomenon itself has existed for some time before its discovery by the writer. The fact that it has not been previously observed speaks strongly for a conception of attentional process in several separate modes. When we are talking to someone, it appears that we do not ordinarily observe his eye movement. Perhaps we have missed other mirrors or gateways to an observation of the activity of the mind. Just as the phi phenomenon indicates that the mind imposes some intrinsic organization on sensory stimulus patterns, this motor phenomenon may give some clues to that underlying organization.

G. SUMMARY

Individuals classified as right- or left-mover on a seemingly universal, visually observable eye-movement phenomenon of attention show systematic physiological differences in patterns of EEG and EOG reactivity in the same simple reaction time sensori-motor sequences of events. This basic individual difference appears to relate to individual differences in higher verbal processes, anxiety, and characteristic functional differences in attentional processes. The phenomenon suggests a Wiener type model of central nervous system organization around an alpha (10 cps) and beta (45 cps) frequency, which is outlined.

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SUPRATHRESHOLD OLFACTORY RESPONSES OF THE RAT MEASURED BY SNIFFING* [1]

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A. INTRODUCTION

This study is a continuation of previous research concerned with the development of methods for evaluating the aversiveness and attractiveness of odorants to rodents (2). The technique developed during the previous research was one that did permit some degree of odor evaluation. The method depended upon measurement of the sniffing of the rat when presented with different concentrations of a chemical in air. The animal was enclosed in a glass chamber within a sound-dampened box and sniffing was recorded as an audio output in experiments during which air was passed to the animal through burlap impregnated with different chemical concentrations. The present research was devoted to improvement of this method and to the use of the improved method as a means for evaluating the degree of attractiveness and aversiveness of odorants known to have these properties. For these purposes beta-nitrostyrene (BNS) was used as the aversive odorant and a liquid food, described in Table 1, was used as the attractant.

Although the early method did provide encouraging results, there are a number of difficulties associated with its use. Of major importance are the following:

1. The life of the burlap impregnation is very short. Furthermore, the use of such a method makes specification of the actual concentrations reaching the animal difficult if not impossible without very elaborate means of chemical analysis.

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[1] This paper is a report of research undertaken in cooperation with the U.S. Army Natick Laboratories under Contract DA-129-AMCO 691 (N). The findings in this report are not to be construed as proof of Department of the Army position. The encouragement of Dr. John Pratt is acknowledged. The research was conducted at Tufts University. The authors are indebted to Dr. Earl Chapin, Western New England College, for designing and conducting the analysis of the BNS. A detailed description of this experimental work, written by Dr. Chapin, may be had upon request to the senior author. The authors are also indebted to the U.S. Fish and Wildlife Service, especially Mr. Robert Tigner, who supplied beta-nitrostyrene which was used in preliminary research and who provided a great deal of valuable information and advice.

TABLE 1

Chemical Formulation of Liquid Diet[a]

Chemical	Weight	Chemical	Weight
Casein Hydrolysate	200.0	Pyridoxine HCl	.0063
Regular Enzymatic		Niacin	.0375
Monosodium Glutamate	5.5	i-Inositol	.2500
Tyrosine Ethyl Ester HCl	10.0	Calcium Pantothenate	.0500
D-Glucose	637.1	Biotin	.0003
Gluconate Solution		Folic Acid	.0005
Glucone-Delta-Lactone	26.09	Ascorbic Acid	.500
Magnesium Oxide (M_gO)	.73	Vitamin B_{12} with Mannitol	
Potassium Hydroxide (KOH)	6.17	(1% trituration)	.1000
Ferrous Gluconate	1.72	Para-Amino-Benzoic Acid	.3000
Distilled water to 100 ml.		D-Glucose	48.7429
Acetate Solution		Fat Soluble Vitamins	
Manganous Acetate $.4H_2O$	.2600	Ethyl Linoleate	4.00
Cupric Acetate $.H_2O$	.0150	Vitamin A Acetate	.0100
Cobaltous Acetate $.4H_2O$	.0090	Calciferol	7 gammas
Zinc Benzoate	.0220	Alpha-Tocopherol	.0500
Ammonium Molybdate $.4H_2O$	.0060	Menadione	.0042
Potassium Iodide (KI)	.0300	Tween 80 (Polysorbate)	6.00
Distilled water to 50 ml.		Esters	
Water Soluble Vitamins		L-Cysteine Ethyl Ester HCl	1.100
Choline Chloride	2.5	Sodium Chloride NaCl	4.800
Thiamine HCl	.0050	Sodium Bicarbonate ($NaHCO_3$)	3.500
Riboflavin	.0075	Fructose-1, 6-Diphosphate	
		Monocalcium Salt	50.500

Note: pH adjusted to 4.8 with Sodium Hydroxide. Weights indicated are for two liters of solution.

[a] Adapted from GBI Technical Bulletin D-18, General Biochemicals Inc., Chagrin Falls, Ohio.

2. The simple audio pickup system which was used was aided by the resonance of the glass chamber. However, within the chamber the animal could assume positions that nullified meaningful measures of the amplitude of the recorded sniff sounds. As a consequence intensity measures were not used in the previous work. Yet, these could be very important.

3. The frequency and rate of sniffing obtained in the chamber was relatively low. In evaluating attractants this actually has some advantage because the investigators' theoretical expectation is that such odors should increase sniffing (2). On the same basis, however, repellents are expected to decrease sniffing measures and a low control sniff rate does not allow a good margin for this decrease.

4. The apparatus had manually operated features that introduced a considerable uncertainty about the timing of the delivery of the odorant to the animal.

B. METHOD

A new flow system was developed which provided an air flow over the chemical which was in solid form. This air flow was then mixed with clean air. The flow system is shown in Figure 1. Briefly, compressed air from a clean-air cylinder (commercial source) was passed through a two-stage regulator. The second stage was maintained at 30 psia. From this, the air was passed through a flowmeter (F-1) and thence through a plastic tube containing the following successive layers: glass wool, calcium chloride, glass wool, silica gel, glass wool, charcoal, glass wool. Following this drying and cleaning, the air was passed to an automatic valve one side of which allowed the air to pass through Port-1, through a flowmeter (F-2) into a copper coil immersed in a constant temperature bath. The heated air was then passed through a flask containing dry, crushed Purina Chow pellets.

When the automatic valve closed Port-1, it also opened Port-2. Air passing through Port-2 was divided into two flows. One passed through valve (V-3) and then through a copper coil immersed in a constant temperature bath. This air was then passed through a flowmeter (F-5) and on to the test chamber. The other flow was passed through valve (V-2) and flowmeter (F-3) and then circulated through flasks containing the chemical to be tested. These flasks were also immersed in the temperature-controlled bath. When beta-nitrostyrene was used, six flasks were employed. When the liquid diet was used, three flasks were employed. After passing through the flasks, the air was sent through a valve (V-5) and a flowmeter (F-4) and then into mixture with the other, diluting air flow. A bypass valve (V-6) in this por-

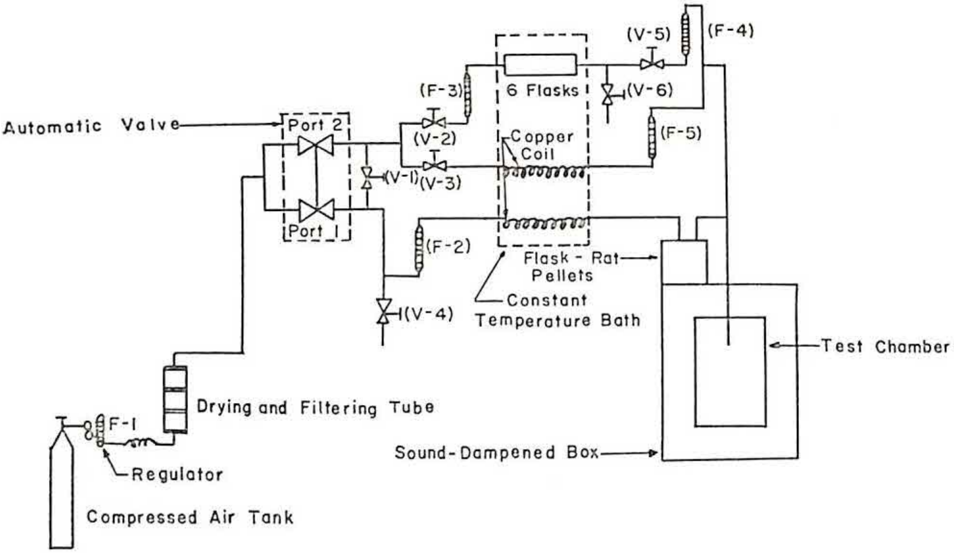

FIGURE 1
FLOW DIAGRAM OF APPARATUS

tion of the line allowed for reduction of the air flow to be mixed with the other line. Thus, the saturation of the repellent- or attractant-saturated air passed on could be held constant while, by this means, the volume of that air could be reduced. To maintain a constant total air flow, the flowmeters in the other line were adjusted. The combined air flow was then passed into the top of the test chamber and out through a tube at the bottom.

The automatic valve was operated by mechanical linkages which were controlled electronically. Back pressures in the line were minimized by this system, since as Port-1 closed, Port-2 opened simultaneously and *vice versa*. The system provided a signal to the recorder which indicated the status of the valve at any time. Electronic timing was limited to three equal cycles of time. As it turned out, for the experiment to be reported below, it was decided to use five cycles. Since the additional two cycles were merely extensions of the first and third, they were timed by the experimenter using the time-marker available on the recorder to monitor the cycles.

Thus, the flow system provided for two kinds of flow cycle: (*a*) A cycle in which air containing a food odor was passed to the animal, and (*b*) a cycle in which air containing the chemical to be tested, but not the food odor, was passed to the animal. As used, the air reaching the animal always flowed at the rate of 2000 cc per minute; the temperature bath was maintained at 80° F., and the flow cycles were 28 seconds in duration.

It was determined from preliminary work that the less restriction to movement imposed on the animal, the more it sniffed. The glass chamber was discarded, therefore, and the animal was enclosed in the sound chamber without it.

The test chamber was that used previously, but, as noted, without the inner glass jar. It was a highly sound-dampened box containing an observation window. The inside was 14¾ × 6¼ × 6¾ inches constructed of smooth hardwood. At the ceiling of the box were placed three crystal microphones in parallel. While this arrangement is not best for high quality sound reproduction, it turned out to be optimal for picking up sniffing, since it acted to filter other, unwanted, sounds. The output of the microphones was passed through three separate circuits. One circuit provided a rectified DC signal to one channel of the recorder (Offner Dynograph); a second provided the AC output of the microphone directly to another channel of the recorder and thereby provided a check against the DC signal; a third circuit provided the sound of the sniff to a pair of stereophonic earphones which were worn by one of the experimenters and were used to provide indications on the DC record as to when the animal was actually sniffing. Thus, a human monitor was used to identify nonsniffing sounds. The system was considered sensitive enough to permit analysis of sniff intensities.

In addition to providing an increased sniff rate by enclosing the animal in a larger space than previously, sniff rate was increased by two other methods. First, the animal was placed on a 23-hour food deprivation regime for four weeks prior to testing. During the last two weeks, just before its usual feeding time, it was placed in the chamber with a small quantity of its usual diet (dry Purina Chow). Thus, the subject became conditioned to expect the presence and odor of food in the chamber. Secondly, during the test run which was always conducted just before the time of this procedure, the animal was placed in the chamber, but without the food in it. During the pretest control period of the test run, the air supply provided the expected food odor as described above. Although quantitative comparisons were not made, there was little question that this procedure raised the basal sniff level enormously. In spite of this, it was found that there would always be a small number of animals who tended to sniff relatively little and to habituate quickly.

Because the liquid food diet was a very complex mixture, no attempt was made to analyze it to determine the actual degree of saturation of air obtained in the flow system. The BNS was analyzed using weight loss of the chemical as the basic analytic procedure.

C. Experimental Procedure

Two experiments will be reported. Both used the same 22 animals, albino females of the CD strain. The first experiment was intended to test the repellency of BNS. Each animal received one test run per day where a run consisted of 140 seconds in the chamber: that is, a test run was five 28-second periods without interruption. The test air containing the BNS was passed to the animal only during the third 28-second period. Air containing Purina Chow odor was passed to the animal during the remaining times. Thus, the test of repellency was one of odor repellency when mixed with a presumed odor attractant (Purina Chow) and the test of attractiveness was one of *increased* attractiveness. Since the same attractant was used at all times, that odor provided a standard test condition. The actual BNS concentrations used were 34, 51, 68, and 300 ppm.

In the second experiment the odor of the liquid food was passed to the animal in the test air. To enhance this as an attractant, the animals were fed a small quantity of the liquid food every day for two weeks prior to the test week. The odorant concentrations used were 11, 18, 32, and 53 per cent. These were the percentages of the test air within the total air flow to the animal. As noted, the actual concentrations were unknown.

D. RESULTS

1. *Experiment I: Repellency of BNS*

Of the original 22 animals, five were discarded as having unusually low sniff rates during the first 28-second period. The data obtained from these animals were not analyzed beyond this period. Of the remaining 17 animals, five more were discarded due to incomplete records associated with an equipment malfunction which occurred during this experiment. Thus, the data to be reported for this experiment are based upon 12 animals.

The data were analyzed with respect to the number of sniffs per second (sniff rate), the total time within each 28-second period in which sniffing occurred, and the intensity of the sniffs as measured by the amplitude of the sniff record. The first two measures were used to calculate the rate of sniffing per 28-second period. The percentage change was then calculated for the third period (BNS) and the fifth period (postexposure control air), in each case with respect to the second period (pre-BNS exposure control air). These percentage measures, therefore, represent the changes due to BNS and the degree of recovery from those changes in the 28-second period *following* a period of 28 seconds after the exposure. The intervening 28-second period (Period 4) was omitted on the assumption that the test chamber was probably not completely cleared of the BNS during an unknown portion of that time.

Figure 2 presents the percentage measures for intensity and for sniff rate. Considering Period 3, which represents the effects of the BNS, it may be seen that the rate of sniffing decreased as the concentration increased over the range of the first three concentrations but that at the highest concentration the sniff rate was slightly greater than at the preexposure level. Intensity of sniffing also decreased, but this decreasing function was continued throughout. The first two intensity points represent a relative increase in sniffing, whereas after

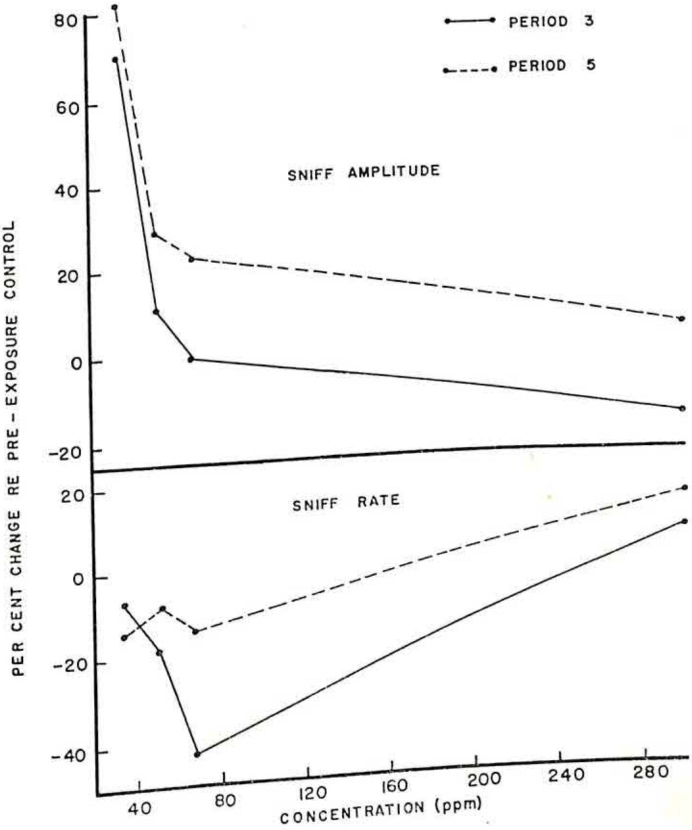

FIGURE 2
RELATIVE AMPLITUDE AND RATE OF SNIFFING IN RESPONSE TO BETA-NITROSTYRENE

that the function represents an increasing relative decrease. Sniff rate represents a relative decrease at all points except for the highest concentration. The results suggest, then, that the general effects of BNS as a function of concentration are first a decreasing and then an increasing sniff rate and a continuously decreasing amplitude. Analysis of variance supported these conclusions in terms of a significant effect of concentration ($p < .01$) for both measures.

Figure 2 also shows that after removal of the BNS both sniff rate and amplitude increased relative to the BNS exposure period. Compared to the pre-BNS control period, the results still indicate a reduced sniff rate at the lower concentrations and an increased amplitude. At the highest concentration, they represent an increase in both sniff rate and amplitude.

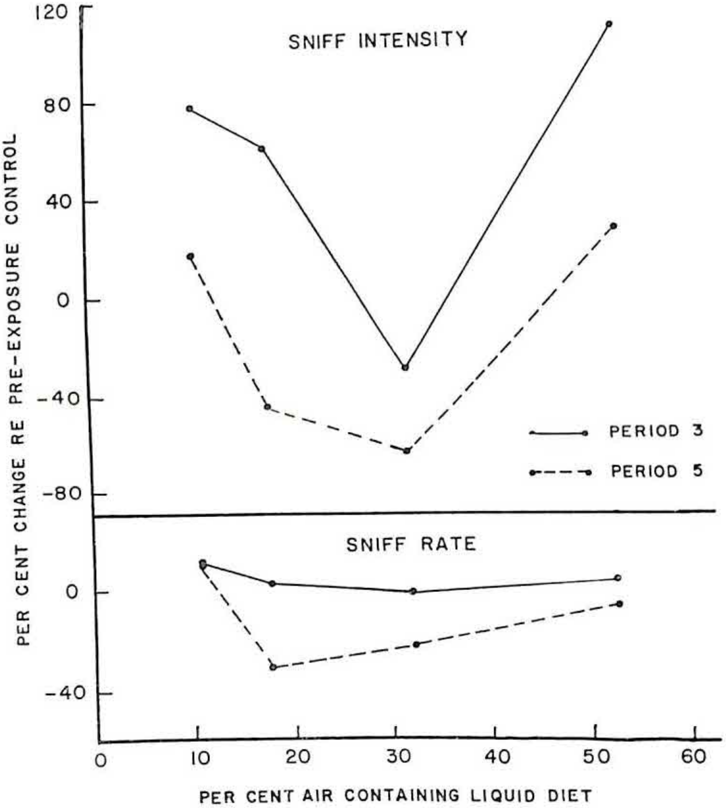

FIGURE 3
RELATIVE AMPLITUDE AND RATE OF SNIFFING IN RESPONSE TO FOOD ODOR

2. *Experiment II: Attractiveness of Liquid Food*

The data to be presented are based on the same 12 animals that were described in Experiment I.

Figure 3 presents the same kind of information for this substance as shown in Figure 2 for BNS. It may be seen that in Period 3 there was a slight increase (10 per cent) in sniff rate at the lowest concentration, but that otherwise sniff rate was apparently not affected by the odorant. Analysis of variance did indicate that the effect of concentration was significant ($p < .01$) and that the differences between the periods were significant ($p < .01$) as well as their interaction ($p < .05$). However, the only systematic difference of importance suggested by Figure 3 in these regards is that the sniff rate during Period 5 was lower than that during Period 2.

Intensity, as shown in Figure 3, increased during Period 3 with the two lowest concentrations, then decreased, and then at the highest concentration increased again. As with the previous figure, this measure was inversely related to concentration through the next highest concentration. The liquid food produced a different effect at the highest concentration, however, in that exposure at this level produced a large increase in the intensity of sniffing.

The results for Period 5 show the same intensity function as Period 3, but the level of the measure was such as to indicate a recovery toward the control level; and, in fact, since the total curve may be seen to be shifted down on the ordinate, the data suggest that intensity not only recovered but decreased even farther in the direction of minimal amplitudes. In the case of the two middle concentrations, intensity decreased to well below the control level. Thus, Period 5 suggests an habituation of intensity in progress. The same habituation effect may be seen with regard to sniff rate, since those values also decreased during Period 5 relative to the Period 3 percentages.

E. DISCUSSION

Elsewhere (2) the investigators stated several hypotheses about changes in sniffing behavior during and following presentation of an aversive or an attractive odorant relative to an ongoing, preexposure level of sniffing. Those relevant to the data presented are the following:

> 1. The rate of sniffing and the amplitude or intensity per sniff should decrease with stimulation by repellents and increase with stimulation by attractants. The amount of change should be a function of the degree of repellency or attractiveness of the odorant.
>
> 2. With continued constant stimulation, sniffing should adapt: that is, the rate and amplitude of sniffing should return to the baseline level. The rate of adaptation should be a function of the attractiveness or repellency of the odorant.
>
> 3. Removal of the odorant provides a new stimulus condition and, therefore, should affect sniffing. Assuming complete adaptation, since removal provides a nonrepellent stimulus, removal should be followed by an increase in sniffing rate and amplitude regardless of the nature of the previously presented odorant. However, following removal of an aversive stimulus, sniff rate and amplitude should be greater and adaptation should be slower than following removal of an attractant.

> 4. Regardless of whether the stimulus is an attractant or repellent, sniff rate and intensity should be inversely related to the concentration of the odorant in the air. This is based on the assumption that, for an air sampling mechanism, the weaker the concentration, the greater must be the air sample required for a decision (2, p. 292).

The present results provide strong support for these hypotheses. Considering the last hypothesis first, the intensity (amplitude) of sniffing was greater the less the concentration of either odorant for the three lower concentrations of each experiment. This is a phenomenon that operates to increase the reduction of the measure for repellents at low concentrations expected from the first hypothesis and to exaggerate the increase expected with attractants. That is, this effect works in the direction opposite to the repellency effect, but in the same direction as the attractant effect. For this reason any set of data may provide an estimate of a repellency threshold which is at too low a concentration and an estimate of an attractant threshold which is not low enough. In the present experiments, since it was necessary for the animals to detect the test substances when masked by a standard odorant, another factor was operating to alter the estimate of the true threshold. On the other hand, the habituation of sniffing of the animals held in a constant, familiar situation is sufficient to require that a sniff-eliciting technique, such as that used, be standard for testing purposes. It is possible that another breed of rat may be more investigatory and, thereby, provide a higher level of preexposure sniffing than that provided by the breed used. In any case, the fourth hypothesis was supported by both sets of data. The support provided by the BNS data was strong for both intensity and sniff rate, whereas for the liquid food data the support may be considered strong in terms of intensity and weak in terms of sniff rate.

Given the effects described, and accepting the first hypothesis, the data from Period 3 indicate that the threshold of repellency of BNS as an odorant is very close to 68 ppm. Presumably, if there had been no masking attractant, a lower threshold would have been obtained. On the other hand, the weak concentration effect described by the fourth hypothesis acts to offset this effect. Thus it seems reasonable to conclude that, for the animals used, the threshold of repellency of BNS indicated by this period is of the order of 68 ppm.

The results do not provide a basis for a good estimate of the attractant threshold, since the intensity of sniffing was increased at all concentrations except one. The results at that one point are difficult to explain. The best that can be said is that the threshold lies somewhere below the concentration represented by 11 per cent as defined by the flow system. The sniffing behavior associated with the attractant effect is one of a markedly increased intensity of sniff, but no change in sniff rate. The failure to find a change in sniff rate is not in accord with the first hypothesis; the increased intensity is.

In comparing the two sets of data, perhaps the most important finding is that a different effect was obtained for the high concentrations. As predicted by the first hypothesis, the BNS effect was a decrease in sniffing, whereas the liquid food effect was an increase. This difference, in a sense, provides a critical test of the method and supports it by showing that the effect of a known repellent is opposite to that of a presumed attractant. Accepting this, the data indicate that the attractiveness of the liquid food and the repellency of BNS lie at least partly in their odors. To what degree they are also associated with their tastes may now be determined inferentially by using this kind of information in a study using the runway method developed earlier (1) to evaluate the aversiveness of a substance due to the combined effects of taste and odor.

The data also provide support of the second and third of the four hypotheses listed above. Following removal of the BNS, both the amplitude and rate of sniffing increased and, thereby, returned in the direction of the pre-BNS control values. Also, the effects during Period 5 were such as to indicate a systematic relationship with the BNS levels during the test period. If we make these hypotheses, we expect sniff amplitudes and rates after removal of the repellent to be greater, the greater the previous repellency; and until adaptation to the removal, we would expect sniffing to exceed the pre-BNS level. This was the finding for intensity, but, except at the highest concentration, not for sniff rate. On the other hand, the BNS data seem to be clear in indicating a persistence of the repellency effect, although at a reduced level, during the fifth period. Whether this was due to an incomplete removal of the odor from the test chamber or due to a prolonged caution of the animals cannot be determined. It is possible that both kinds of factor were operating. That the results were not critically due to a failure of removal of the odorant is supported, however, by the finding that the attractant amplitudes and rates were markedly reduced during the fifth period. While the required rates of removal may not have been the same, nevertheless, the marked decrease in sniff behavior following removal of the attractant odor suggests that the clean air flow was at an effective rate. Furthermore, the data presented are for the fifth period. There was a 28-second period between the end of the test exposure and the beginning of the fifth period during which the chamber was being washed by the clean air flow. There is no way of being sure, of course, but it seems reasonable to assume that any artifact of continued contamination during the fifth period was probably of a very small order.

Assuming that the fifth period data were not importantly influenced by a continued presence of the test odorants, the third hypothesis provides another basis for determining the thresholds. That is, the stronger the presented odors, the greater should be the sniff response following their removal. The fourth period data would provide the best means of inspecting this effect except that there it must be assumed that the air supply was still contaminated at least during the first part of the period. Thus, the fifth period provides the safer test. With regard to BNS, the data in this period suggest an increased sniffing at all concentrations. The actual percentage increases in intensity in order of increasing concentrations were 11.9, 18.6, 23.1, and 21.3. Thus, the expectation of an increased response as a function of concentration was clearly supported by the data except for the highest concentration. Again, that effect could have been a failure to remove the substance completely or a continued caution on the part of the animal.

The same question may also be considered by comparing the fifth and third periods in terms of sniff rate. Here the changes from the third to the fifth period in percentages were —7.1, 11.5, 27.7, and 7.5. Again, the highest concentration failed to produce a greater recovery than did lower ones except that for this measure the lowest concentration was associated with a decrease. Except for the lowest concentration, the effect was the same.

The failure of the fifth period sniff rate to show an increase following removal of the lowest concentration, when it did following removal of the next higher one, suggests that the repellency threshold indicated by the third period data may have been too high. That is, the method provides two estimates of the threshold: (*a*) the effect produced by presenting the odorant, and (*b*) the effect produced by removing it. On the second basis, it would appear that the threshold was of the order of 51 ppm or less, but greater than 34 ppm. With both methods, the results suggest a repellency threshold of between > 34 ppm and 68 ppm. The data do not permit the same kind of analysis for the liquid food.

F. Summary and Conclusions

The results provide support for the method used and also suggest that, for the animal used, the threshold of BNS as a repellent odor lies approximately between 34 ppm and 68 ppm. In addition, the results indicate that, of the measures used, intensity is the more sensitive. On this basis, it would appear that further development of the method should enhance the reliability and precision of the intensity measure. It is likely that the audio technique used alone is close to the limit of doing this, since any further attempt to increase the precision of measurement of sniff intensity will have to contend even more seriously than at present with noise produced by body movements, etc. On the other hand, measures of breathing in conjunction with audio measures of sniffing would provide the clearest of all possible data for application to the problem. Further, if the breathing measures were obtained by telemetry, they would have the following advantages:

1. They could be obtained while the animal was being studied in any desired situation.
2. They would not restrict movement of the animal and, therefore, would provide no interference to its sniffing for this reason. Care would have to be taken to use a transducer which would not impose serious restrictions to breathing and which would not be subject to movement artifacts.

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A METHOD OF OBTAINING SUMMARY SCORES FROM SEMANTIC DIFFERENTIAL DATA*

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A. INTRODUCTION

One of the advantages frequently claimed for use of the semantic differential (12) is that it enables the investigator to collect judgments about large numbers of concepts within a relatively short time space, and without the task of constructing sentence-statements for each of a wide variety of concepts.

This advantage, however, has seldom been realized in actual research. One reason for the failure of investigators to capitalize on the properties of the differential to collect large amounts of data is that they are then faced with some unique problems of analysis.

The present paper reports the use of the differential to collect a large number of judgments about a large number of concepts, outlines the analysis problems encountered, and presents some solutions for handling these problems.

B. DATA COLLECTION AND PRELIMINARY RESULTS

Data were collected before and after health training of 271 Peace Corps Trainees[2] to determine simultaneously (*a*) the effect of different teaching teams and (*b*) the effect of two different teaching methods on training effectiveness. A two-by-two factorial design was used.

Both before and after training, Trainees were given a special form of the semantic differential which required the Trainee to rate 24 illnesses on eight bipolar semantic differential scales. Additionally, on another special form of the differential, each Trainee was required to judge 27 health-related or illness-preventing behaviors necessary in the host country overseas. Thus, each of the Trainees was asked to judge a series of illnesses which he might encounter in the host country (ranging from tapeworm to malaria, for example), and a series of behaviors (refusing to eat lettuce, for example) which would

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help him avoid illness in the host country, or which pertained to community health-related activities.

Preliminary factor analysis separated average judgments of illnesses into two major factors, which we have called "severity" and "avoidability." Preliminary factor analysis of the behaviors indicated that the authors had successfully constructed a scale to measure the "likelihood" of expressed intention to follow health-related behaviors, with a single factor accounting for most of the variation in judgments of behaviors, and the adjective pair "likely-unlikely" most highly loaded on that factor.

C. Problems of Analysis

Two problems arose in final analysis of the data. The first concerned factor scoring of the illness data. On the first, or severity factor, three scales had exceedingly high loadings on that factor. On the second factor, only two scales had high factor loadings. The investigators were thus faced with using only two or three single adjective scales for factor scoring, or with finding some method of factor scoring other than that usually used.

The second problem of analysis involved the quantity of data collected. In a before-after design involving information or attitudes, it was considered necessary to control for pretraining scores, even though Trainees were randomly assigned to teaching groups. This suggested analysis of covariance as the proper analytic technique. However, the investigators were then presented with the necessity of performing 75 separate analyses of covariance (analyzing 24 illnesses on each of two factors plus 27 behaviors on a single factor). Although computer time was available, there was a problem of interpretation of results: the usual significance levels are meaningless with that many related tests.

The alternative option was a multiple analysis of covariance for each test, with unequal *N*s per cell; but such a procedure has not yet been programmed for the computer, and the interpretation of results is exceedingly complex in that we are testing whether a series of hyperplanes are different, rather than simply testing the differences among a series of lines.

It seemed reasonable, then, to attempt to find some method of summary scoring the two tests so that we could examine *not* whether there were significant pre-post training differences on each illness on each factor, but whether, for each factor, there were significant differences for the total range of illnesses judged. Similarly, we preferred to test whether or not there were before-after differences for the total range of expressed likelihood of personal health-related behavior, and community health behavior.

D. APPROACHES TO FACTOR SCORING FOR INDIVIDUALS

Constructed originally as a measure of meaning, the differential was initially analyzed on a scale-by-scale basis (8, 12). In 1953 and 1954, however, a number of factor analyses were completed, and between that time and 1957, before publication of the basic reference on the differential, there were dozens of replications. Repeated factor analyses showed three major factors of "meaning," labeled by Osgood and his associates as "evaluation," "potency," and "activity." Both early and later studies (2, 9) using the evaluative dimension of the differential as a measure of attitude have simply summed the individual's responses on the scales which were highly loaded on the evaluative factor to obtain a so-called factor score.

Such summing procedures can be justified when the scales all have high and similar loadings, but they unequally weight those with proportionately lower loadings. For example, in the present study, it seems reasonable to sum over the scales "good," "mild," and "simple," with loadings of .92, .92, and .90. However, if the scale with the next highest loading is added (painful), it would be weighted equally in the summed factor score, even though the loading is only .63.

Several writers [e.g., Bartlett (10)] give more sophisticated methods of factor scoring which have advantages over that of simple addition. First, estimates are made of the factor loadings, then the covariance matrix is computed and used to weight each response to arrive at a factor score. This method has the advantage of utilizing responses to all items (or, with the differential, all scales), but it imposes an added mathematical burden on the investigator, requiring two complex computational steps.

As Lawley and Maxwell (10) point out, relatively precise factor scoring is a two-stage process but component scoring, using principal component analysis, eliminates one of those steps.

In the present study, then, to retain the advantage of using all responses and, further, to permit a geometric interpretation of the obtained scores, a principal component analysis was performed and component scores, rather than factor scores, were computed by multiplying each response on a scale by the component coefficient of that scale.

Principal component analysis was suggested by Hotelling (6) in 1933 as an alternative method to factor analysis for reducing the number of variates in a test. It has not been widely used in psychology, primarily because it was computationally difficult to use with large numbers of variates. With the widespread use of computers, however, the computational problems are eliminated.

A potential major disadvantage of component analysis is that it is not invariant to changes in scale. With semantic differential data, however, where all information is collected on seven-point scales, this property of component analysis appears unimportant.

On the positive side, component analysis is simple to describe geometrically. Also, there is only a single method of component analysis, and results from study to study are more directly comparable than with factor analysis, where there are several alternative methods of arriving at factor solutions. Further, in factor analysis, we begin with a model of the number of factors and their mathematical relationships and determine the extent to which the data agree with our model. In component analysis, on the other hand, we begin with the actual data and look for components which will reduce the number of meaningful variates (5).

E. COMPUTATION OF COMPONENT SCORES

In the present case, we begin with a three-dimensional collection of data including p scales, q concepts, and N subjects. We wish to reduce these data to get a single score for each individual. The problem, then, is to sum over scales, then over concepts or stimuli.

We reduce the three dimensions to a two-dimensional $p \times q$ array of means, $\overline{X}_{ij\cdot}$, with $i = 1, \ldots p$, and $j = 1, \ldots q$. These means, as in factor analysis, are standardized.

The object now is to reduce the array still further by finding a linear transformation of the type $C_m = \sum_{i=1}^{p} \theta_{mi} \overline{X}_{ij\cdot}$, so that the $p \times q$ becomes a $1 \times q$ array. These θ_{mi} will be chosen so that C_1, the first of the new C_m, has as large a variance as possible, C_2 is next chosen with as large a variance as possible, given that it is uncorrelated with C_1, and so forth.

Suppose, for example, that we look at a case with $p = 2$ scales and $q = 24$ illnesses. Because we are working with means, by the central limit theorem, we can assume that these approach normality, so that if we plot the 48 means into 24 points in a dimensional space equal to the number of scales (two dimensions), our points will tend to fall within an elipsoid centered at the origin. It is simplest to present this in a two-dimensional space, but the generalization to higher dimensions is straightforward.

Figure 1 shows a two-coordinate space with the means over *S*s on one adjective scale plotted against the means on the second adjective scale. Each point on Figure 1 represents the judgment of a single illness on the adjectives "clean" and "frequent."

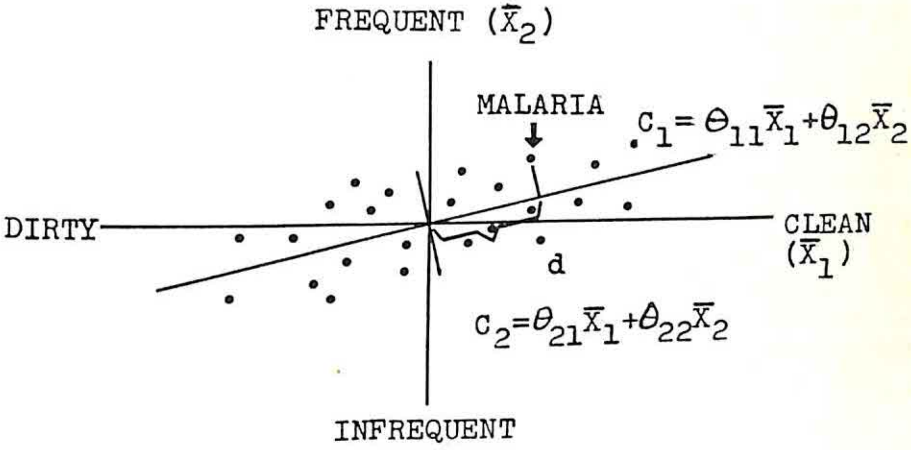
FREQUENT ($\bar{X}_2$)
MALARIA
$C_1 = \theta_{11}\bar{X}_1 + \theta_{12}\bar{X}_2$
DIRTY
CLEAN ($\bar{X}_1$)
d
$C_2 = \theta_{21}\bar{X}_1 + \theta_{22}\bar{X}_2$
INFREQUENT

FIGURE 1

EXAMPLE OF A PRINCIPAL COMPONENT SYSTEM WITH TWO SCALES

The first component can be thought of as the principal axis of the elipsoid enveloping the points, or as a new coordinate system having an axis where maximum variance among points is found. The distance, *d,* found by dropping a perpendicular line from a point (average judgment of the illness) to the new or principal axis, and measuring the distance from that point to the origin, now gives us the value of C_1 for that concept or illness. The variance of C_1, denoted by λ_1, is found by solving the characteristic equation of the correlation matrix set equal to 0. Also, it can be shown (7) that

$$\sum_{m=1}^{p} \lambda_m = p.$$

For example, an illness which is viewed as "clean" and "frequent" would have a high positive component score, whereas one which is viewed as "infrequent" and "dirty" would have a high negative component score.

If the elipsoid is very thin, then the first component (C_1) accounts for the major proportion of the variance; if it is not, we must consider more components (C_m), orthogonal to the one already computed.

The coefficients found in component analysis are not analogous to correlation coefficients, as in factor analysis, but are cosines of the angle the principal axis makes with the original axis system. Thus $\sum_{i=1}^{p} \theta^2{}_{im} = 1$ (the sum of squares of cosines equals one). This makes coefficients more difficult to interpret because, for the first few components, they will appear lower than those obtained in factor analysis.

However, for ease of interpretation, and for comparability with other work, component coefficients may be transformed to approximate unrotated factor loadings which would be found with the diagonals set at 1, and a principal-factor solution used (5). Table 1 gives the results of the present study in both principal component and factor analysis solutions, including the transformed values of the component coefficients which were obtained by multiplying each coefficient by the square root of the eigenvalue ($\sqrt{\lambda_m}$), the variance of that component.

TABLE 1
COMPARISON OF FACTOR LOADINGS AND COMPONENT COEFFICIENTS FOR JUDGMENTS ON THE ILLNESS FORM OF THE DIFFERENTIAL

	Component coefficients				Rotated	
	Untransformed		Transformed		Factor loadings	
Scale	C_1	C_2	C_1	C_2	F_1	F_2
Good	.48	—.07	.96	—.11	.92	—.21
Mild	.47	+.12	.94	.19	.93	—.01
Simple	.47	+.21	.93	.34	.90	—.00
Not painful	.41	—.09	.82	—.14	.63	—.18
Curable	.25	+.48	.50	.76	.45	.10
Clean	.18	—.49	.36	—.78	.10	—.89
Avoidable	—.24	+.44	—.48	.70	—.28	.41
Infrequent	.01	—.52	.02	—.84	.04	—.25

Using the principal component analysis, specific component scores were found for each S for each concept (illness or behavior) by the following method:

$$C_{\cdot jkm} = \sum_{i=1}^{p} \theta_{im} X_{ijk}$$

where $i = 1, \ldots, p$ scales,
$j = 1, \ldots, q$ concepts,
$k = 1, \ldots, N$ subjects.

The component scores, derived from the mean judgments on each concept, are independent. However, when we substitute individual scores for mean scores over subjects, those individual specific component scores are not necessarily completely independent. For example, the correlation between mean values over subjects on component 1 and 2 is zero, but when component 1 and 2 scores for individuals are compared, component 1 and component 2 show a correlation of .205.

We have, however, reduced the number of scores from $p \times q \times N$ to $q \times N$ for each component. Additionally, we have the advantages of Bartlett's technique, in that we use each scale in proportion to its loading or coefficient on the dimension in which we are interested, but we do not have the added mathematical manipulation his technique requires.

Further, we now have the data in a form that may be more meaningfully plotted in two-dimensional space. With traditional methods of summing over highly loaded scales, we work with a space which is essentially square and uses the same scale: for example, a +3 to —3 scale for each of the two axes. Graphically, this suggests that Factor 1 and Factor 2 are of equal importance. With specific component scores, however, the axis system will be proportionate to the amount of variance which each component contributes to the average judgments of concepts.

F. COMPONENT SCORING OVER CONCEPTS: OBTAINING SUMMARY SCORES

It has previously been shown that the distance, d (see Figure 1), of the average judgment of a particular concept along the component axis may be considered a component score for that concept, giving us q scores (one for each concept) on each component. In the present case, we still have 24 illnesses by two components. There was a single component on the 27 behaviors, but these behaviors can be separated into two sections—personal health and community health. Although we have made our original "factor scoring" more stable, by using all our data, we still have too much data to handle comfortably.

As in the case of the traditional method of factor scoring the differential, our simplest alternative is to sum over concepts in the way that we sum over scales in an individual test. Greenbaum and Wang (4), with the same problem, did sum over responses to the stimulus words "mentally retarded," "moron," "imbecile," and "idiot," although the words would appear to have rather different evaluative meanings.

Again, however, we would be equally weighting all stimuli (in the present case, all illnesses or all behaviors) even though we know that average judgments of those illnesses fall at different distances from our origin along our component-axes.

With the present data, it appeared more reasonable to find a summary score over concepts for each individual for each component or section of the test, using a weighting system. Thus, a summary score for the individual's judgment of all the illnesses on each illness component was determined by weighting the illness by its component scores, so that

$$\Lambda\,..\,km = \sum_{j=1}^{q} \mid C_{jm} \mid C_{\cdot jkm}$$

For $k = 1, 2, \ldots N$ subjects.

Using the absolute value of the component score for each concept, we are weighting those concepts (illnesses) most heavily that are viewed by *S*s as being more easily differentiated by that component. Absolute values were used so that extreme concepts would not arithmetically cancel each other out.

In effect, then, for Component 1 (severity) we have taken each individual's judgment of the severity of an illness ($C_{\cdot jk1}$), weighted that judgment by the relative importance of severity in the average judgment of that illness, and summed all such judgments over the q illnesses.

Variations of the method can be used for special purposes. For example, if the individual's judgments of the *avoidability* of illness were weighted by the component score of each illness on the *severity* of the illness, this would accomplish the kind of weighting proposed by Fishbein (3), where beliefs about an object are scored by taking into account the evaluative aspect of the belief.

The mathematical properties of these summary scores have not yet been investigated. They originated in a logical attempt to reduce a large amount of data to a few simple summary scores by which we could assess changes attributable to a health training course.

These summary scores may now be used in further statistical analysis. We can, for example, perform an analysis of covariance (teaching team × teaching method, with original score controlled) to determine the extent to which Peace Corps Trainees changed in their judgments of the severity of illness they will be exposed to overseas, given the sample of illnesses used in the current study.

G. SUMMARY AND DISCUSSION

The semantic differential (12) was carefully developed over a period of years as a data-collection instrument whereby judgments of many concepts could be quickly and easily collected. Recent years have seen adaptations and newer data-collection uses for the differential (11, 13), but relatively little attention has been paid to methods of analyzing data from the differential.

The present paper suggests that principal component scoring is an effective method, using more of the data than the usual "factor-scoring" technique. It demonstrates that component coefficients can be transformed to yield results highly similar to those of factor analysis, which are then more easily interpretable, with loadings ranging from ±1.

Component scoring has the added advantage, when two-dimensional plots are desired for data inspection or presentation, of arranging concepts within an axis-system which is proportionate to the variance explained by each coordinate, rather than within a system assuming that the coordinates (factors) are of equal importance.

The paper expands the notion of component scoring so that a summary score over concepts for each component can be easily computed, weighting each concept as it loads on that component, and using all concepts to contribute to the summary score. This procedure permits the use of substantial numbers of replicated concepts in a given experiment, avoiding as much as possible the error of improperly sampling objects (1), but giving data easily reducible to a few scores which can then be used for further statistical analysis.

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EFFECT OF SPATIAL STABILITY OF THE STIMULUS ON FREE RECALL ABILITY*

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A. INTRODUCTION

It has been demonstrated on several occasions that the learning of the sequential arrangement of a series of discrete verbal items is facilitated by stimulus conditions which aid *S* in apprehending the material as a stable entity possessing definite internal and external structure. When, for example, the series is readily perceived as a spatial configuration because of the spatial ordering of the items, learning occurs with relatively great rapidity (1, 2, 5). When the homogeneity of a list of similar elements is disturbed by the inclusion of distinctive items—thus further differentiating the internal structure—there may result superior learning of not only the deviant items but of the entire series (6). Moreover, when stimulus instability is established by the systematic variation of the temporal position of members of a series, learning becomes extremely difficult (3).

In the present study, the role in the learning of discrete verbal items played by stimulus conditions conducive to the perception of a collection of items as a stable structure is investigated in a free, rather than sequential, recall task. In a free recall task, *S* may recall items in any order; he is not required to reproduce any sequence that may be intrinsic in the stimulus complex or demonstrate any knowledge of interrelationships between stimulus components. The purpose of the study is to ascertain whether in the relatively permissive free recall situation, where *S* need not have knowledge of anything outside of the items themselves, learning will be facilitated by stimulus conditions which assist *S* to apprehend the stimulus complex as a unitary, ordered structure.

Two conditions, seemingly widely different in potential for inducing perception of the stimulus as a stable configuration, were employed. In one, nonsense syllables were displayed in constant spatial positions from trial to trial: that is, each syllable occupied the same separate position on successive exposures of the material. In the other, the spatial location of syllables varied randomly from trial to trial. The first condition is one of stability; the second,

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one of erratic change. If the free recall ability for nonsense syllables depends on a perceptual experience of stimulus stability, performance should be better under the condition of position invariance.

B. METHOD

1. *Procedure*

The free recall of simultaneously presented nonsense syllables under conditions of constant and varying spatial location of the items was studied in three essentially identical experiments. In the constant position (CP) condition, each of eight syllables retained its spatial position, while in the variable position (VP) condition the position occupied by a syllable changed erratically on successive trials. In both conditions the same syllables were arrayed in a circular pattern; it was the location within this circular array that changed for syllables in the VP condition. Subjects were randomly assigned to one or the other of the conditions.

For all *S*s, there were alternated 30 brief tachistoscopic exposures of the circularly arranged syllables and 30 free recall tests. Immediately after an exposure, *S* wrote on a separate slip of paper as many of the syllables as he could. The alternation of exposures and tests occurred with minimal time intervals between successive elements.

There was variation in exposure or test time in the three experiments, which variation distinguishes the experiments. In the first experiment, the exposure interval was one second and the time allowed for writing syllables on a single test was 15 seconds. In the second experiment, the exposure interval was one second and the test interval, 20 seconds; and in the third, the intervals were two and 20 seconds, respectively. Both intervals were intentionally made short in order to increase the difficulty of the task of imposing order on the stimulus in the VP condition. The test interval was lengthened by five seconds in the second experiment because *S*s had complained that 15 seconds is not enough time simply to write eight syllables. The exposure interval was increased to two seconds in the third experiment to determine whether the results of the previous two were learning or perceptual effects. With a one-second exposure interval, *S*s receiving the VP condition might not be able to see all the syllables and, thus, poorer performance for these *S*s than for *S*s with the two-second exposure interval might be due to a perceptual, not a learning, factor.

In the VP condition, five arrangements of syllables were used. The same sequence of five arrangements was presented six times for a total of 30 presentations.

The projector-type tachistoscope permitted the running of *S*s in groups. The syllables were flashed on a classroom blackboard.

The syllables used were selected from the Glaze (4) list and had 40-50 per cent association values.

Only one measure of performance was used: viz., the number of syllables correctly recalled.

2. *Apparatus*

A Lafayette Instrument Company tachistoscope (Model V22CL) was used to present the syllables. Since the longest exposure setting is one second, the T setting and a stopwatch were used to make the two-second exposures in the third experiment.

3. *Subjects*

The *S*s were students in psychology classes at the University of North Carolina at Charlotte. The number of *S*s in the CP and VP conditions in the three experiments, from first to third, are 12 and 13, 11 and 8, and 21 and 20.

C. RESULTS

Since first-trial performance was not affected by the experimental conditions, these data are not included in any of the following analyses. Suffice it to say that, in all experiments, mean first-trial recall was slightly higher for the VP group than for the CP group.

The results of the three experiments are quite similar, as can be seen from the learning curves of Figure 1. After approximately equal first-trial performance (see previous paragraph), mean recall score for the CP group begins almost immediately to increase at a more rapid rate than for the VP group. The continuing divergence of the curves over the remainder of the trials indicates that, to the very end of the trials, the learning rate was higher for the CP group than for the VP group. Clearly, performance was superior under the CP condition.

Separate analyses of variance were performed for the three experiments, with the result that the impressions gained from an inspection of Figure 1 are confirmed. The significant conditions (A) and conditions × trials (A × B) effects indicate that both the absolute level and the rate of learning were greater under the CP condition than under the VP condition. Summaries of these analyses are contained in Table 1.

(The curves shown in Figure 1 and the analyses of variance summarized in Table 1 are based upon different-sized trial blocks. The points of Figure 1 were, with the exception of the first, obtained by computing for each *S* the

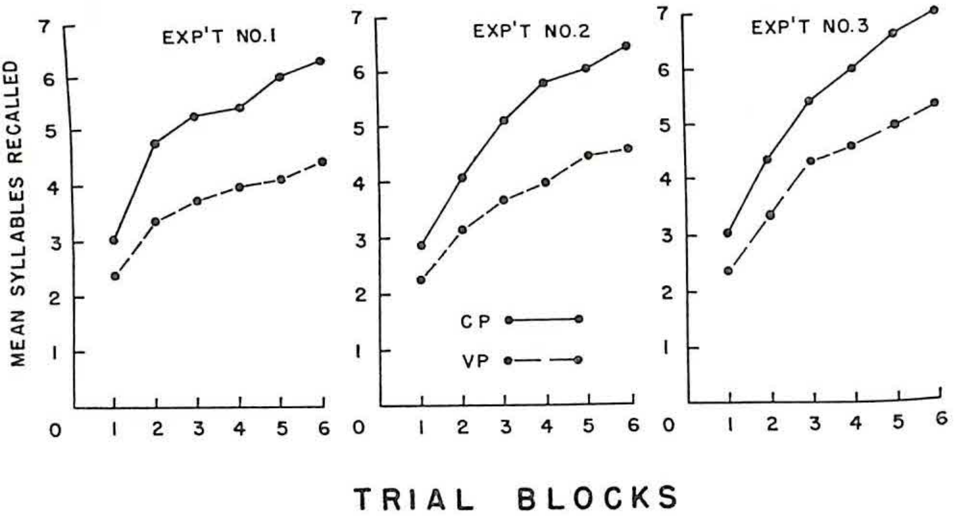

FIGURE 1
FREE RECALL PERFORMANCE AS A FUNCTION OF SPATIAL-POSITION STABILITY (OR INSTABILITY)

mean of groups of five successive trials, beginning with Trial 6, and then finding the mean of the individual means for the group. The first point represents performance on Trials 2-5. The data on which the analyses of variance were performed are the 14 means of groups of two successive trials, beginning with Trial 3, plus the scores on Trial 2.)

TABLE 1
ANALYSES OF VARIANCE FOR NUMBER OF SYLLABLES RECALLED

Source	Experiment 1 *df*	Experiment 1 *F*	Experiment 2 *df*	Experiment 2 *F*	Experiment 3 *df*	Experiment 3 *F*
Conditions (A)	1	10.37**	1	4.56*	1	8.01**
Error (a)	23		17		39	
Trials (B)	14	40.64**	14	77.42**	14	91.28**
A × B	14	3.16**	14	25.17**	14	2.68**
Error (b)	322		238		546	

* $p < .05$.
** $p < .01$.

D. DISCUSSION

The finding of superior CP group recall in Experiment 3 (two second-exposure intervals and 20-second tests) would seem to indicate that the different performances under the two experimental conditions are not the result of the greater ease with which all the syllables may be visually apprehended under the CP condition. With only a one-second exposure interval, it is conceivable that an *S* in the VP condition would entirely miss seeing one or more of the syllables in the 30 exposures, which occurrence would account for the poorer VP group performance than CP group performance. It is unlikely that a syllable would be missed in the CP condition, since *S* could insure his seeing of all the syllables by systematically advancing his gaze around the circular array. With the two-second exposure interval of Experiment 3, *S*s had ample time to see all the syllables on a single exposure. Thus, the finding of better CP group performance in the third experiment inspires increased confidence in the notion that what we have in this study is not a perceptual effect, but, instead, a learning one.

That free recall performance may depend on *S*'s being able to perceive the stimulus complex as a stable structure suggests that rote memorization is more than either the mechanical absorption of information to which *S* is repeatedly exposed or the direct seizing of discrete bits of information by acts of mental brute force. Instead, it appears that the simple committing to memory of discrete items, without regard for the intrinsic ordering of the items, does involve the imposition of order on the collection by the learner. Learning will be facilitated when the individual perceives the items as forming a stable structure or configuration; it is much easier to remember an item that is a component of some stable stimulus configuration than to remember one that stands alone. Where the stimulus complex has some intrinsic organization (as in the CP condition), the task of imposing order is easy. Where this is lacking, the task of bringing order to the stimulus increases in difficulty and, consequently, so does learning.

An alternative interpretation of the present results, which has apparent simplicity and cogency, utilizes S-R theory. In the CP condition, spatial positions are perfectly correlated with the syllables, whereas in the VP condition this is not true. Hence, only in the former condition do spatial-position stimuli serve as cues for recalling syllables, which accounts for the superior performance under this condition.

There are objections, however, which may be raised against this explanation. First, spatial-position stimuli are not objectively present during the free recall test, which is an unaided recall situation. S-R theory is hard pressed, then, to explain, without a good deal of deductive sleight-of-hand, how *S* is able to respond at all in the free recall test. Then, the explanation fails to take into account conditions which should give an advantage to *S*s in the VP condition.

The fact that syllables are not uniquely associated with spatial positions means that not one but several spatial stimuli have the potential to evoke the recall of a given syllable, which should increase the probability of the recall of the item. For similar reasons, the probability that any item will be recalled at a particular moment should be increased under the VP condition. The point is that, appearances notwithstanding, the S-R position does not permit an unequivocal prediction of relative recall performance under the two experimental conditions.

E. Summary

Three similar experiments were performed to ascertain the effect of constant spatial location of nonsense syllables on free recall ability. In a constant spatial position (CP) condition, the same circular array of eight syllables was tachistoscopically presented 30 times. In a variable position (VP) condition, the positions of the syllables within the array were changed erratically on successive exposures. Following each presentation, *S* wrote, in any order, as many of the syllables as he could. The three experiments differed in exposure interval and time allowed for the free recall test. In all experiments, the rate of learning was significantly greater under the CP condition than under the VP condition.

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INTAKES OF NaCl BY RATS IN EXTENDED TWO-BOTTLE DRINKING PREFERENCE TESTS*

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A. INTRODUCTION

Caloric factors appear to outweigh in importance those related to palatability in the regulation of food intake by laboratory rats (4, 5, 6). Prepotency of bodily need over palatability in the compensatory selection of NaCl by adrenalectomized rats, however, has not been so clearly identified. Several investigators (2, 3, 7, 8) have attributed the increased intake of NaCl following adrenalectomy to a spontaneously developing appetite for sodium. Where free choice of NaCl is possible, these investigators have found that NaCl intakes are increased to consistently maintained levels at which the postoperative sodium deficits are reduced to the least possible levels of severity. In contrast, Bare (1) observed that rats do not ingest constant amounts of NaCl in free choice situations. Bare concluded, as have Young (9) and Young and Chaplin (10), that the degree of preference manifested for a particular NaCl concentration, rather than the extent of physiologic need, in large part governs the intake of NaCl. The differing results from these studies suggest the need for further exploration of how bodily need and palatability influence NaCl intakes by rats. In the present study, long-term measures of preference were carried out for the purpose of better identifying the effects of bodily need and palatability in the selection of NaCl solutions than has been done in previous studies. These effects were explored through use of adrenalectomized rats in a state of chronic sodium depletion and of normal rats supplied sufficient sodium for adequate nutrition.

B. METHOD

1. *Subjects and Apparatus*

Naive female rats of the Holtzman strain, aged 150-170 days, were randomly assigned to six experimental groups and to six control groups, with the limitation that no more than 10 rats were assigned to a group. Throughout the experiment, each of the rats was individually housed in a cage measur-

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ing 8 × 11¼ × 8 inches and was given food and fluid *ad libitum*. Room temperature was held at 24 degrees C, and the relative humidity was maintained at approximately 60 per cent.

2. *Preliminary Procedure*

During an initial period of 10-15 days, all groups were given a commercial sodium-deficient test diet (Nutritional Biochemical Corp.), to which 1 per cent NaCl was added; and distilled water was available in two 200-milliliter Richter-type drinking tubes attached to each of the individual living cages. The tubes were switched in position every 24 hours, and clean tubes with fresh fluids were presented every 48 hours.

At the end of the initial habituation period, all groups were submitted to surgery under ether anesthesia and aseptic conditions. The experimental groups were bilaterally adrenalectomized. Sham operations, identical in detail to those performed on the experimental groups, except for removal of the adrenal glands, were carried out on the control groups. Replacements as required were drawn from a group of supplemental animals that had undergone habituation to the two-bottle choice situation.

Following surgery, all subjects were returned to the individual cages, and a bioassay measure of the effectiveness of the operation was carried out with the adrenalectomized experimental groups. During bioassay, each experimental rat was maintained on distilled water and the previously employed sodium-deficient test diet, but without the 1 per cent NaCl supplement. Body weights were taken at eight-hour intervals. As soon as an experimental rat met the criterion of 10 per cent body weight loss, preference testing was commenced with the animal. If the criterion of weight loss had not been met by the seventh postoperative day, another adrenalectomized rat, drawn from the supplemental group, that had met the weight-loss criterion was entered as a replacement. The mean length of the postoperative period required to meet the criterion was 4.7 days for the experimental animals used in preference testing. During bioassay, the control groups were maintained on distilled water and on the sodium-deficient test diet plus 1 per cent NaCl. Preference testing was initiated with the control groups on the seventh postoperative day.

3. *Preference Testing*

Consecutive 24-hour, two-bottle drinking preference tests were performed with the experimental and control groups during a 45-day period. At the start of the period, each of the six experimental groups was randomly paired with one of the control groups, and both groups were offered a single NaCl concentration opposite distilled water. The six test concentrations were graduated in .3 per cent steps from a 1.2 per cent NaCl solution to a 2.7 per cent NaCl solution; thus, the concentrations ranged from a point within the zone of maximally preferred NaCl solutions upward to a distinctly avoided NaCl solution (11). The NaCl concentrations were specified in terms of percentage concentration by weight and were prepared from reagent crystals dissolved in distilled water. Fluid intakes from the pair of Richter-type tubes attached to each cage were recorded every 24 hours. Each 24 hours, also, fresh fluids were offered in clean tubes, and the tubes were shifted in position. Throughout testing, the adrenalectomized experimental groups were maintained on the sodium-deficient test diet, and the sham operated control groups were given the same diet plus a 1 per cent NaCl supplement. Thus, it was possible to compare a sodium depleted group of rats with a sodium repleated group at each of the six NaCl concentrations.

C. RESULTS

Table 1 shows the mean total daily intakes of milligrams of NaCl in five-day blocks over the 45-day drinking preference period for the experimental and control groups.

TABLE 1

MEAN TOTAL DAILY INTAKES OF MILLIGRAMS NACL BY SIX GROUPS OF ADRENALECTOMIZED RATS AND SIX GROUPS OF SHAM OPERATED RATS

	Adrenalectomized groups		Sham operated groups	
Days	Mean total daily mg NaCl intakes	*SD*	Mean total daily mg NaCl intakes	*SD*
1-5	32.7	7.6	28.9	13.3
6-10	31.9	4.9	24.3	8.2
11-15	33.5	4.3	19.2	4.1
15-20	35.6	1.5	17.8	4.2
21-25	35.4	4.1	16.9	3.8
26-30	34.9	3.8	18.3	3.5
31-35	34.2	3.2	15.5	4.2
36-40	33.5	3.2	16.4	3.9
41-45	34.5	3.3	17.0	2.2

Data contained in Table 1 indicate that the experimental groups and the control groups ingested milligrams NaCl in insignificantly different amounts during the initial five days of testing ($t = 0.78$, 118 df, $p > .10$). During the final five days of testing, however, the milligrams-NaCl intakes significantly differed between the experimental and control groups ($t = 13.88$, 118 df, $p < .01$). Table 1 further indicates that the mean total daily intakes of milligrams NaCl by the six experimental groups remained much the same over the nine successive five-day blocks. Comparison of the total mean daily intake of milligrams NaCl during Days 1-5 with Days 41-45 showed insignificant difference ($t = 1.52$, 59 df, $p > .10$). In contrast, the total mean daily intakes of milligrams NaCl for Days 1-5 and Days 41-45 by the control groups were significantly different ($t = 5.46$, 59 *df*, $p < .01$).

TABLE 2

Mean Daily Intakes of Milligrams NaCl by the Adrenalectomized and Sham Operated Rats Assigned to Each of the Six Test Concentrations

	Mean daily mg NaCl intakes during test days 1-5		Mean daily mg NaCl intakes during test days 41-45	
% NaCl concentration	Adrenalectomized	Sham operated	Adrenalectomized	Sham operated
1.2	39.6	27.4	33.6	33.2
1.5	36.8	37.1	39.8	30.0
1.8	31.3	27.1	36.8	19.7
2.1	28.6	27.7	30.4	5.4
2.4	35.4	36.5	33.7	9.6
2.7	24.8	22.3	32.7	4.0

Table 2 presents the intakes of milligrams NaCl at each of six concentrations by both the experimental group and the control group assigned the particular concentration for Days 1-5 and for Days 41-45. Inspection of Table 2 suggests that there was much overlap in milligrams-NaCl intakes by the experimental and control groups during Days 1-5. For Days 41-45, however, there was, in general, little similarity between the milligrams-NaCl intakes of the experimental and the control groups. The milligrams-NaCl intakes by the control groups rather steadily declined as the NaCl concentrations decreased in palatability. Thus, intakes of milligrams NaCl by the control group offered 1.2 per cent NaCl during Days 41-45 significantly differed from that of the control group given 2.7 per cent NaCl in the same period ($t = 10.54$, 18 *df*, $p < .01$). The experimental groups offered choice of NaCl opposite water, in contrast to the control groups, regulated milligrams-NaCl intakes independently of the concentration at which NaCl was presented. The point is shown by the fact that the mean daily intakes of milligrams NaCl by the experimental group given 1.2 per cent NaCl and the experimental group presented 2.7 per cent NaCl during Days 41-45 differed in statistically insignificant fashion ($t = .09$, 18 *df*, $p > .10$).

Ingestion of constant daily amounts of NaCl apparently contributed to the survival of the experimental rats in the preference testing period. However, the elevated level of NaCl intakes by the experimental groups produced amelioration rather than remission of the consequences of adrenalectomy. Mean body weights of the experimental groups declined from 222 *SD* 9.1 grams on the initial postoperative day to 201 *SD* 15.7 grams on Day 45 of the preference period. During the same span of time, the mean total body weights of the control groups increased from 218 *SD* 7.0 grams to 242 *SD* 12.6 grams. The difference of 41 grams in mean total body weight between the experimental groups and the control groups at the end of testing was significant ($t = 12.17$, 118 df, $p < .01$).

D. Discussion

Table 1 indicates that the sham operated control groups, fed a diet containing 1 per cent NaCl, exhibited considerable reduction in mean total milligrams-NaCl intakes during the first 15 days and continued to ingest NaCl at a low and fairly stable level during the remaining 30 days of the preference testing period. The adrenalectomized experimental groups, suffering from chronic sodium insufficiency and fed a sodium-deficient diet, ingested NaCl at a significantly higher and consistently maintained level from the beginning of preference testing until the termination of the experiment than did the control groups. These findings contrast with those of Bare (1), Young (9), and Young and Chaplin (10), who found variability rather than consistency in the selection of NaCl by rats in preference tests. The present findings are in line, however, with those of Epstein and Stellar (3), who report elevated and stable intakes from a 3 per cent NaCl solution by adrenalectomized rats. An explanation of the contrasting sets of results may lie in the use of brief preference tests with a small number of rats by Bare (1) and in the fact that Young (9) and Young and Chaplin (10) allowed their adrenalectomized rats to have access to a 4 per cent dibasic sodium phosphate solution throughout the period of NaCl preference tests.

In the present study, the sham operated rats were sodium repleted during testing because 1 per cent NaCl was included in their diet. The adrenalectomized rats, however, were forced to rely upon a single NaCl concentration for reduction of the syndrome of sodium insufficiency. Table 2 shows that the sodium repleted control groups apparently responded to the test concentrations on the basis of the palatabilities of the several solutions during Days 41-45. Table 2 also shows that the sodium depleted experimental groups may have responded to the novel tastes of the NaCl solutions partly on the basis of palatability during Days 1-5. By Days 41-45, though, the experimental groups exhibited a pattern of preference for NaCl, which was quite independent of the strength of the NaCl concentrations, for the rats ingested equivalent amounts of milligrams NaCl from all six test solutions. Thus, factors of palatability appear to have governed NaCl intakes by the control groups and to have played a role subordinate to those of bodily need in the NaCl intakes by the control groups. The findings suggest that rats in a state of persistent sodium need regulate intakes of NaCl, independently of the palatability of the available source of NaCl, in a fashion analogous to their ability to regulate daily caloric intakes.

E. SUMMARY

The study reports comparison of bodily need for sodium with the palatability of NaCl sources as determinants of preference for NaCl over distilled water in two-bottle drinking tests. Rats in a state of chronic sodium depletion and sodium repleted rats were used in the comparison. The rats were initially assigned at random to 12 groups, with each group limited to 10 animals. Six groups were adrenalectomized, and the other six groups were sham operated. Replacements were entered as needed in consequence of surgery and for the adrenalectomized rats failing to meet a postoperative weight-loss criterion. An adrenalectomized group was paired with a sham operated group at each of six different NaCl concentrations during a drinking-test period of 45 days. Palatability appeared to determine the selection of NaCl by the sham operated groups and to play a role subordinate to that of bodily need in the NaCl intakes by the adrenalectomized groups.

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MICE OF A FOUR-WAY CROSS: COAT COLOR ASSOCIATED WITH BEHAVIOR AND RESPONSE TO D-AMPHETAMINE*[1]

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A. INTRODUCTION

One of the easiest characteristics to observe directly in animal subjects is coat color. Geneticists have long used coat color as a marker for tracing an animal's hereditary background. The idea that coat color may be related to behavioral characteristics is not a new one. Keeler (9, 10) indicated that albino animals differed from their pigmented siblings in a wide variety of species. Recently, Winston and Lindzey (29) suggested that the action of the albino gene (homozygous recessive condition of the c allele at the C-locus in linkage group 1) contributed significantly to water escape performance and to responses to other noxious stimulation in mice. The usefulness of single gene mutant mice for the study of behavior, suggested by Denenberg, Ross, and Blumenfield (2), has been studied by Fuller (4). He reported that albino mice resulting from a single gene mutation of the pigmented C57BL/6J performed less well than pigmented *S*s. These results support the general observation with inbred strains of mice that albino *S*s are "inferior" to pigmented *S*s on a variety of behavioral tasks (5, 14).

Another approach to the problem of coat-color relationship to behavior can be made using mice from a heterogeneous genetic background in which coat color can be easily identified. This report describes a series of experiments carried out on *S*s from a four-way cross which yielded three coat colors: black, brown, and white in the approximate ratio of 2:1:1. The general question was to see if performance on a variety of measures would be related to coat color, and to determine if albinism on a heterogeneous genetic background would yield inferior performance when compared to pigmented *S*s with a similar genetic background. The specific measurement situations involved open field

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testing for activity and emotionality, learning of a spatial or visual problem at different water temperatures, submersion time in water under load conditions, and effects of d-amphetamine on water escape and submersion time under load conditions.

B. Subjects

The origin of the four-way cross *S*s used in these studies is presented in Figure 1. Only male offspring from the mating of the two hybrids were used representing three coat colors in the following percentages: 56 per cent black, 19 per cent brown, and 25 per cent white. These mice were obtained from the Production Department of The Jackson Laboratory.

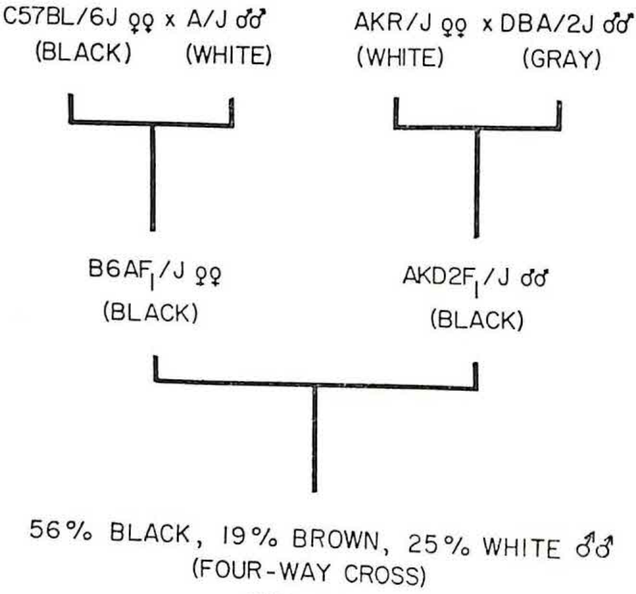

FIGURE 1
Origin of Four-Way Cross Mice

C. Experiment I: Open Field Behavior

Since most of the reported differences in performance between inbred strains of mice of different coat colors have utilized measures of open field behavior (5, 14), the first experiment reports the relationship of coat color to open field performance.

1. *Subjects*

*S*s were naive male four-way cross offspring representing black ($N = 50$), brown ($N = 50$), and white ($N = 50$) coat colors. They were between 215 and 245 days of age and had been housed from weaning two to four per cage in standard mouse cages (5 × 11 × 5.5 inches). Food and water were available *ad libitum*. Laboratory conditions were uniform, with room temperature at 72 ± 3°F, and lights on from 7 A.M. to 7 P.M. These animals were selected from a large pool of animals and matched for weight. They weighed between 33 and 48 grams.

2. *Apparatus*

The open field was a neutral gray vinyl surface, 36 × 36 inches, divided into 6-inch squares and enclosed by a wall 18 inches high. It was placed on the floor 8 feet under fluorescent lights with uniform illumination.

3. *Procedure*

Each *S* received one trial of 180 seconds duration. It was placed on the starting square in one corner of the open field and restricted by a barrier. After five seconds, the barrier was removed starting the trial. The following measures were recorded: (*a*) *latency* (seconds) to place four feet outside the start square; (*b*) *squares traversed* or the total number of squares entered by the mouse; and (*c*) *defecation* or the number of boluses left on the field at the end of the trial. The field was cleaned after each *S* was tested.

4. *Results and Discussion*

The means and standard deviations for the three measures are presented in Table 1. Although statistical analysis of these data was not significant, the white *S*s had the shortest latencies, traversed more squares, and had a higher production of boluses than did the pigmented *S*s. These results differ from those reports with inbred strains in which albino *S*s were reported to be less active and less emotional when compared to pigmented strains (5, 14).

TABLE 1

OPEN FIELD TEST MEASURES OF MICE FROM A FOUR-WAY CROSS WITH DIFFERENT COAT COLORS

		Coat color		
Measure		Black (N = 50)	Brown (N = 50)	White (N = 50)
Latency in seconds	Mean	43.07	39.99	22.34
	SD	51.59	52.26	33.22
N squares traversed	Mean	26.42	23.62	30.80
	SD	20.99	19.97	19.65
N boluses	Mean	2.94	2.74	3.32
	SD	2.00	1.99	2.21

D. Experiment II: Preference, and Spatial and Visual Learning

Several reports have indicated that inbred albino strains perform poorly on learning tasks involving water escape motivation in a runway (29), on a visual discrimination task (27), and on both visual and spatial discrimination problems (24). This experiment was performed to determine if coat color would be related to performance on a learning task, as suggested by findings with inbred strains.

1. *Subjects*

Sixty naive male mice of black ($N = 20$), brown ($N = 20$), and white ($N = 20$) coat colors from the four-way cross previously described were used as *S*s. The *S*s were between 275 and 305 days old and were matched for weight.

2. *Apparatus*

The test apparatus was a water tank especially designed and constructed (Thorsen Engineering Corporation, Ellsworth, Maine) so that water temperature could be controlled from 40-170 ± 1°F. The apparatus consisted of three units: a test tank (24 × 70 × 24 inches, inside dimensions), a mix tank (24 × 18 × 24 inches, inside dimensions), and a heater-chiller unit. The tank was made of 18-gauge galvanized steel, painted a flat neutral gray, and insulated throughout with styrofoam. The mix tank contained the thermostatic controls (Partlow LFS, Utica, New York) for the setting and controlling of the desired water temperature. A pump circulated water between the mix and test tanks, so that the desired water temperature for a given task was always present. This design gave consistent temperature readings everywhere in the test tank with less than ± .5°F variation. Whenever the mix tank temperature deviated from the desired setting, pumps forced water between it and the heater-chiller unit, engaging either the hot water heater (State, P14001, Ashland City, Tennessee) or the cold water chiller (Heat-X, CCP10L, Brewster, New York) depending upon demand.

For the preference and initial training task, the test tank was set up with a start box, barrier, and an escape ramp. The start box was an individual unit (5 × 3 inches) with a drop-bottom to immerse the *S* in the water. It was placed in the center at the head of the tank. The barrier (24 × 10 inches), half of each side painted flat black or flat white, was placed across the width of the tank at a distance of 23 inches from the head of the tank. In the center of each half of the barrier was a 3- × 5-inch opening which could be closed by a tight fitting door. With the water level set at the appropriate level of 18 inches, *S* faced an opening 3 × 3 inches with 2 inches of the opening below the water surface. An aluminum V extended from the head of the tank to the barrier, enclosing the start box and ends of the barrier. This was to orient the *S* to the barrier and avoid nongoal-directed swimming behavior. An escape ramp (24 inches wide) made of mesh screen was located 5 inches behind the barrier and covered the width of the tank.

For the learning task, a second barrier, identical to the first, was placed 8 inches behind the first barrier and the escape ramp relocated 5 inches behind it. The water temperature in the tank was set at 95 ± 1°F.

3. *Procedure*

For the preference and initial training part of the test sequence, *S*s received 10 trials per day for five days. A single barrier with both openings left open was used with the white half appearing randomly 50 per cent of the time on either the left or right side in the following series over the 10 trials: LLRLRRLLRR. Each *S* was placed in the start box, and after five seconds was dropped in the water. The choice of opening or preference for either black or white, right or left, was recorded in addition to the time required for the animal to pass through the barrier. Between trials, animals were placed in drying boxes with absorbent materials and were given a minimum rest period, or intertrial interval, of 10 minutes.

For the learning sequence, half of each coat-color group was assigned randomly to either the spatial ($N = 10$) or visual ($N = 10$) task for 10 trials per day for 10 days. Since the learning task required the use of a second barrier, the white half of this barrier appeared randomly 50 per cent of the time on either the right or left side in the following series over the 10 trials: RLLRRRLLRL. For the visual problem, the white side was left open and the black side closed for both barriers. For the spatial problem, the task was a single left-right alternation with the left side open on the first barrier and the right side open on the second barrier regardless of the color. The opposite sides were closed. Latency and errors to reach the second barrier were recorded. An error consisted of body contact with the incorrect side of the barrier. *S* was scored with a maximum of one error per barrier per trial regardless of the number and duration of incorrect contacts. The criterion for learning was eight out of 10 errorless trials on two successive days. All *S*s, however, were run for the total 10 days or 100 trials in order to keep experiences equal. A 10-minute intertrial interval was used as previously described.

4. *Results and Discussion*

a. Preference: On the first five days (50 trials) of free choice responding, it was possible to determine *S*'s preference for either visual or spatial performance with the one barrier. *S*s were so characterized if they made eight out of 10 consistent responses on two successive days on the basis of either spatial (left or right) or visual (white or black) choice. No *S* showed a visual preference, but 14 (70 per cent) of the black, 15 (75 per cent) of the brown, and 16 (80 per cent) of the white mice formed a spatial preference. The rapidity with which mice of different coat colors formed spatial preferences did not differentiate between groups. There appeared to be little difference in choice of spatial preference for either left or right. In all coat-color groups, approximately 60 per cent formed right and 40 per cent formed left preferences.

The mean latency per *S* per trial for the preference test is presented in Figure 2. These data were subjected to an analysis of variance for a repeated measurements design (28). A significant days effect ($F = 14.24$, $df = 4/228$, $p < .01$) was found with latencies decreasing over the five days. Although there was no significant difference between mice of different coat colors, comparisons between groups with the Newman-Keuls test (28) showed that white

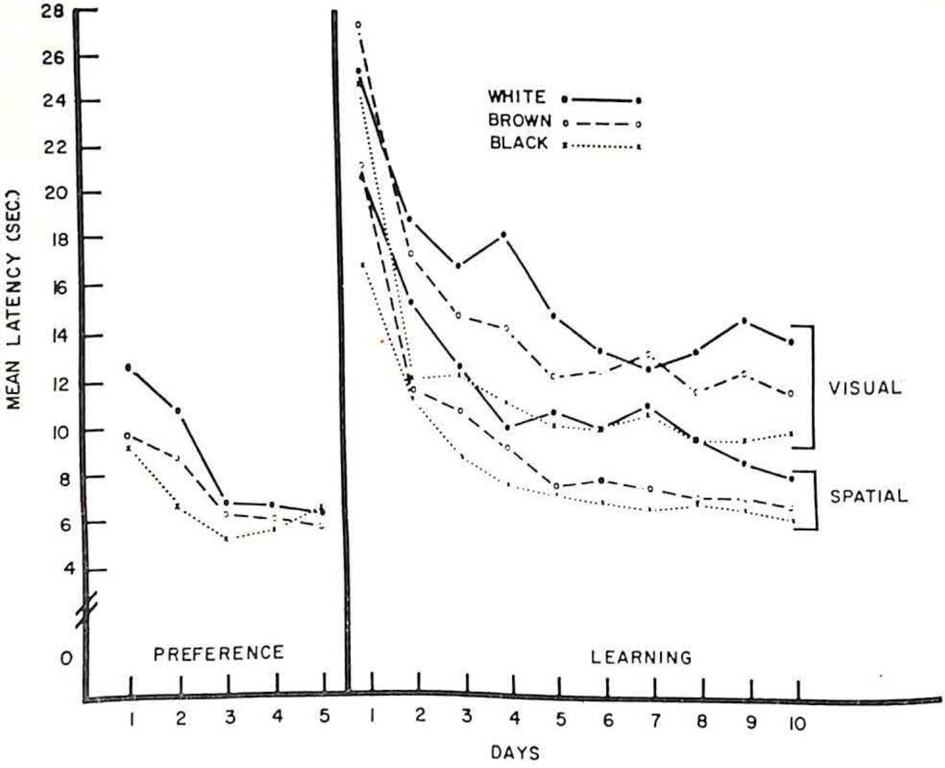

FIGURE 2

MEAN LATENCY FOR PREFERENCE AND LEARNING OF VISUAL AND SPATIAL PROBLEMS FOR MICE FROM A FOUR-WAY CROSS WITH DIFFERENT COAT COLORS mice had significantly ($p < .05$) longer latencies than black mice to reach the barrier in the preference test.

b. Learning: The mean latency per *S* per trial over 10 days for both the visual and spatial learning problems is presented in Figure 2. These data were subjected to the same type of analysis of variance as previously described. There was a significant coat-color effect ($F = 4.77$, $df = 2/54$, $p < .05$), with black mice having the shortest latencies and white mice the longest. Individual mean comparisons were made between the coat-color groups by the Newman-Keuls test and showed that only the white mice had significantly longer ($p < .05$) latencies than black mice. As days progressed, the latencies became shorter ($F = 79.42$, $df = 9/486$, $p < .01$). The visual task resulted in significantly longer latencies than the spatial problem ($F = 20.26$, $df = 1/54$, $p < .01$).

The errors and days to criterion scores on both learning tasks are presented in Table 2. *S*s that did not reach criterion received a score of 10 for days to criterion and the accumulated total errors over the 10 days of testing. Analysis of variance of error scores revealed significant effects of the learning problem ($F = 117.18$, $df = 1/54$, $p < .01$) and coat color ($F = 18.95$, $df = 2/54$, $p < .01$). Mice learned the spatial task with fewer errors than mice on the visual task. Individual mean comparisons between coat-color groups by the

TABLE 2

ERRORS AND DAYS TO CRITERION ON LEARNING TASKS FOR MICE FROM A FOUR-WAY CROSS WITH DIFFERENT COAT COLORS

Measure and task	Coat color		
	Black	Brown	White
Errors to criterion			
Visual			
N	10	10	10
Mean	65.0	76.2	102.4
SD	24.93	22.43	13.88
Spatial			
N	10	10	10
Mean	16.4	18.1	48.9
SD	10.47	12.27	24.75
Total			
N	20	20	20
Mean	40.7	47.15	75.65
SD	31.11	34.61	33.68
Days to criterion			
Spatial			
N	10	10	10
Mean	4.6	4.6	8.4
SD	1.78	1.71	2.50

Newman-Keuls method showed that the white mice made significantly ($p < .05$) more errors than either the black or brown animals.

It should be noted that the days to criterion score for the visual problem was not included, since only five black, three brown, and zero white mice out of 10 per group reached criterion within the 10 days. This was in contrast to the following number of mice out of 10 per group that reached criterion on the spatial problem: 10 black, 10 brown, and four white. An analysis of variance of the days to criterion for these animals on the spatial task revealed a significant effect of coat color ($F = 10.97$, $df = 2/27$, $p < .01$). A comparison of the individual means of the coat color groups by the Newman-Keuls test showed that the white mice required significantly ($p < .05$) more days to learn the problem than either the black or brown animals.

These results have demonstrated that a visual task was more difficult to learn than a spatial one regardless of coat color. Furthermore, the white coat colored mice in contrast to their pigmented (black and brown) littermates had slower swimming speeds and made more errors. These data supplement a previous report by Werboff and Anderson (24) which demonstrated that albino inbred mice of the A/J strain were inferior to pigmented inbred mice of the C57BL/6J strain in learning the same set of problems. In this experiment the four-way cross albino mice demonstrated some learning of the visual problem. In the previous study, the A/J mice showed no evidence of learning the visual problem. The differences and similarities between these two reports suggest that there may be a common factor associated with the albino gene that results in slower swimming performance and poorer learning, but that the expression of this factor is modifiable depending upon the genetic background. In the albino inbred strain, the deficit appears to be a general one affecting all learning tasks, while on a heterogeneous background only the more difficult cognitive tasks, such as the visual learning problem, are seriously affected. This interpretation is supported by data from the report by Meier and Foshee (15) who indicated that a random bred albino strain (CF_1) was superior to an inbred albino strain (BALB/c) in learning a water maze.

E. Experiment III: Preference, and Spatial Learning and Reduced Water Temperature

It has been generally accepted that water temperature affects the learning and performance of a swimming task in rats (6, 26). These reports have demonstrated that extremes in water temperature (cold and hot) resulted in shorter swimming latencies to escape than water at body temperature. The colder water temperature (59°F) was more effective than the warmer temperature (113°F). Waller, Waller, and Brewster (22) found that reduced water temperature below body temperature shortened swimming time of mice on a simple visual discrimination problem in a T maze. No effect was evident on error scores. However, Wimer and Weller (27), using mice in the same apparatus with two levels of water temperature, demonstrated that hot water (113°F) resulted in less errors than did cold water (68°F). The present experiment is an extension of Experiment II to determine if reduced water temperature has any effect on performance and learning of the spatial problem.

1. *Subjects*

Nineteen white and 20 black mice from the four-way cross were used as *S*s. These groups were selected because it appeared from the previous experiment that these were the most divergent in learning performance. *S*s were between 275 and 305 days of age, and weighed between 33 and 48 grams.

2. *Apparatus and Procedure*

The same apparatus and procedure as described in Experiment II were used for the spatial learning task. Mice were evaluated under two levels of water temperature, both below the 95°F level of Experiment II. These temperatures were 55 and 75 ± 1°F.

3. *Results and Discussion*

a. Preference: With the use of the single barrier, it was possible to determine the effects of water temperature on the formation of either spatial or visual preferences in black and white coat colored mice. At 55°F, seven (70 per cent) black and nine (90 per cent) white mice showed a spatial preference, while at 75°F, 10 (100 per cent) black and six (67 per cent) white mice demonstrated the formation of this preference. Analysis of these data by Fisher's exact probability test (19) indicated that only the comparison between black and white mice at 75°F yielded a significant ($p < .05$) difference. No mice showed any visual preferences.

The mean latency per S per trial for the preference test is presented in Figure 3. These data were subjected to an analysis of variance using a least squares solution due to unequal *N*s (28). White mice had longer swimming latencies ($F = 4.79$, $df = 1/35$, $p < .05$) than black mice. Higher water temperature also resulted in longer swimming latencies, but this was not significant ($F = 2.09$, $df = 1/35$, n.s.). Repeated swimming experiences over days significantly shortened swimming time to reach the barrier ($F = 158.05$, $df = 4/137$, $p < .01$).

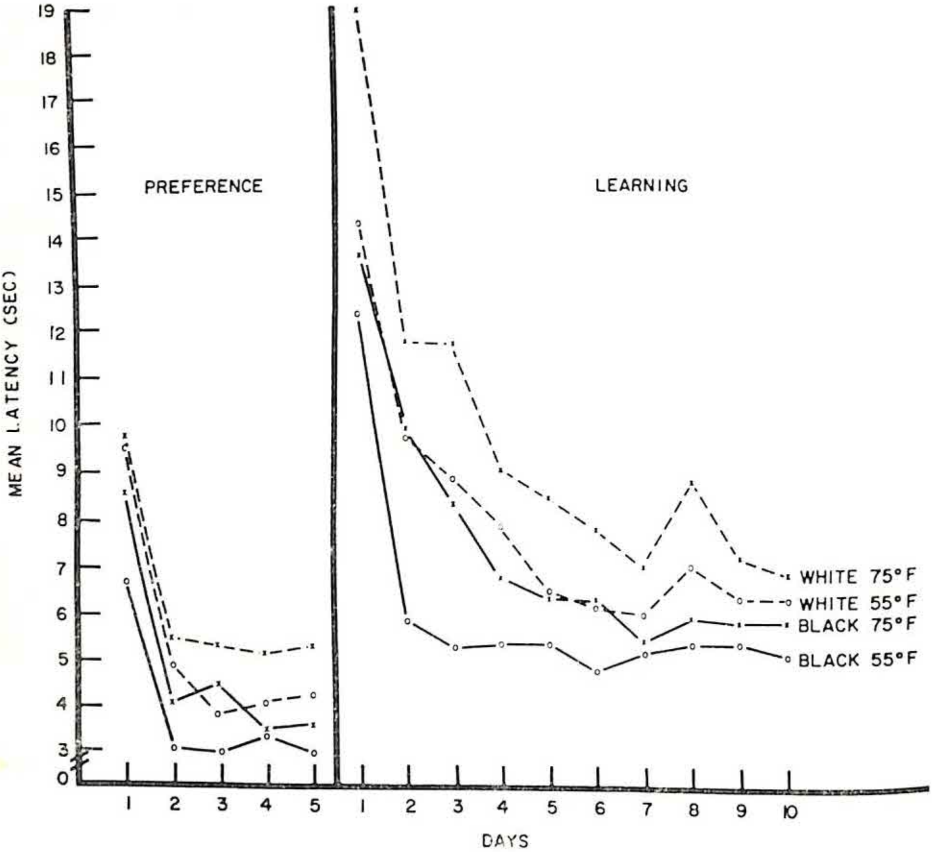

FIGURE 3
Mean Latency for Performance and Learning of a Spatial Problem at Different Water Temperatures for Mice from a Four-Way Cross with Black and White Coat Colors

b. Learning: The mean latency per *S* per trial over 10 days for learning the spatial problem at two levels of water temperature is shown in Figure 3. Analysis of variance of these data using a least squares solution (28) indicated that white mice had longer swimming latencies during learning ($F = 7.41$, $df = 1/35$, $p < .01$) than black mice. Higher water temperatures also resulted in longer swimming latencies ($F = 4.45$, $df = 1/35$, $p < .05$). The days effect or repeated experience was also significant and resulted in shorter latencies ($F = 73.61$, $df = 9/315$, $p < .01$). There was a temperature × days interaction ($F = 1.99$, $df = 9/315$, $p < .05$), which was due to the differential initial rate of decline in latency scores. This decline was more rapid at 55 than at 75°F.

The errors and days to criterion scores for the spatial task at both water temperature levels are presented in Table 3. Only one black mouse at 55°F and three white mice at 75°F failed to reach the criterion of learning. Again, if *S*s did not reach criterion they received a score of 10 for days to criterion and the total accumulated errors of the 10 days. Analysis of variance of the data in Table 3 showed that white mice made more errors ($F = 17.08$, $df = 1/35$, $p < .01$) and required more days ($F = 7.07$, $df = 1/35$, $p < .05$) to learn this task than did black mice. The lower water temperature (55°F) resulted in mice making fewer errors ($F = 5.54$, $df = 1/35$, $p < .05$) and requiring fewer days ($F = 4.45$, $df = 1/35$, $p < .05$) to learn the task than mice tested at water temperature of 75°F.

TABLE 3

Errors and Days to Criterion on Spatial Learning at Lowered Water Temperature for Mice from a Four-Way Cross with Black and White Coat Colors

Measure and temperature	Coat color	
	Black	White
Errors to criterion		
Temperature: 55°F		
N	10	10
Mean	17.40	30.50
SD	14.33	11.14
Temperature: 75°F		
N	10	9
Mean	21.60	49.00
SD	8.41	23.99
Days to criterion		
Temperature: 55°F		
N	10	10
Mean	4.60	5.50
SD	2.07	1.18
Temperature: 75°F		
N	10	9
Mean	5.10	7.50
SD	2.14	2.60

These results replicate and extend the data of Experiment II to demonstrate that white mice are inferior to black mice in learning and performing a spatial problem. Lower water temperature enhanced both learning and performance of all *S*s. Within the limits of this experiment, there was not a differential effect of increased motivation (lower water temperature) on mice of different coat colors. These data could not shed additional light on the question of increased learning proficiency through the use of higher water temperatures as suggested by the Wimer and Weller report (27). Although they did not find differences between the two inbred albino (A/HeJ and RF/J) strains evaluated at the high water temperature, it is possible that mice of different coat colors might react differentially at the higher water temperatures.

F. EXPERIMENT IV: WATER SUBMERSION

The results reported indicate that white *S*s are not as adequate in performance and learning as their pigmented (black or brown) littermates. A previous report by Werboff, Haggett, and Anderson (25), comparing inbred albino (A/J) to pigmented (C57BL/6J) mice on a severe survival task, indicated that the albino mice are clearly superior to C57B465 mice. Experiment IV was included to determine if the coat-color differences among the heterogeneous *S*s existed in the response to the severe stress of the water submersion test.

1. *Subjects*

A total of 38 mice (19 white and 19 black) from the previous experiment were used as *S*s after a one-week rest period.

2. *Apparatus and Procedure*

For the water submersion test, five gray metal cylinders (12 inches in diameter and 16 inches deep) were inserted in the water tank with the water level maintained five inches below the upper edge of the cylinder. Up to five animals could be tested simultaneously. Water temperature was maintained at 105 ± 1°F.

Prior to testing, each *S* was weighed. A weight in the ratio of two grams: 30 grams body weight was attached by means of a safety pin to a nine millimeter wound clip one inch from the base of the tail. Each *S* was held with forceps by the tail approximately 18 inches above the water surface and released. Time to submersion in seconds was recorded. This was defined as the time interval between the release of *S* and the fifth consecutive second during which no part of the body was above the water surface. Each *S* received only one trial with a maximum duration of 1800 seconds.

3. *Results and Discussion*

The mean times to submersion scores for the black and white coat colored mice were 18.56 and 118.00 seconds, respectively. The difference between these scores was significant ($t = 2.00$, $df = 36$, $p < .05$). On this survival task, the white *S*s were superior to the black. It is of interest to note that these scores are in the same direction as those obtained for the inbred white (A/J) and black (C57BL/6J) strains (25) which were tested under the same conditions, but were not of the same age. The difference was much greater in the genetically heterogeneous animals of the four-way cross, and may be attributed to aging effects interacting with the genetic determiners of this behavior. The superiority in time to submersion of the white over the black mice may be related to situational factors concerned with conservation of energy. Since the white mice are slower swimmers, their inactivity may facilitate staying afloat in contrast to the black mice. The black mice make frantic, energetic movements which lead to rapid exhaustion and submersion.

These results are in contrast to those reported by Fuller (4), who found behavioral differences between albino and pigmented C57BL/6J mice when the albinism resulted from a single gene mutation. Using a water escape task, he demonstrated that the albino mice appeared to be more fatigued by swimming than were the pigmented mice. These differences may be attributed to the different requirements between the various types of task used.

G. EXPERIMENT V: RESPONSE TO D-AMPHETAMINE

Because of recent interest in the area of pharmacogenetics (8, 17) and the report by Meier, Hatfield, and Foshee (16) that inbred mice of various strains respond differently to amphetamine, this experiment was performed to determine if there would be differences between the mice of the four-way cross on several psychopharmacological measures.

1. *Subjects and Drugs*

The mice used in this experiment were the same 150 animals from Experiment I that had been tested in the open field. The drug used was dextroamphetamine sulfate obtained as the soluble powder (Dexedrine—Smith, Kline, and French). The drug was prepared with distilled water in three concentrations so that the total volume of injectable fluid would be approximately .25 cubic centimeters. The levels of dosage injected were 5.0, 10.0, or 20.0 milligrams per kilogram (mg per kg). The control fluid for injection was distilled water given in the same volume by the *S*'s weight. Injections were given intraperitoneally with the behavioral tests starting at one hour ± 10 minutes after the injection. A noninjected control group was handled in a manner similar to the experimental groups.

The design was a 3 × 5 factorial design with three coat colors (black, brown, and white) and five levels of drug (noninjected, and distilled water injected control groups or d-amphetamine at 5, 10, or 20 mg per kg). There were 10 animals per cell in 15 treatment groups.

2. *Apparatus and Procedure*

Two water performance measures were used with the same water tank as previously described. These measures were three days of runway and the submersion test on Day 4. For the runway task, the water tank was divided into six runways (4 inches × 70 inches) by placing gray metal partitions at appropriate positions in the tank. The sides of the runway extended 5 inches above the water line. A multiple start box with individual compartments (4 × 3 × 5 inches) permitted sudden immersion of the animals. A multiple goal box with individual compartments containing a wire mesh ladder extending at a 45° angle into the water allowed the *S* to escape. Water temperature was held at 105 ± 1°F and *S*s were tested with no attached weights.

Day 1 consisted of three runway trials without drug. Time was recorded from the moment of immersion until the mouse mounted two front feet on the escape ladder. *S*s received an intertrial rest period of at least 10 minutes in a cage with shavings. On Day 2, each *S* was weighed first to determine the volume of either drug or control fluid injection. After waiting the prescribed time (one hour) after injection, *S* was tested as in Day 1. Day 3 was run in an identical manner to Day 1. If *S* failed to reach the goal within 180 seconds it was removed, placed on the escape ladder, and received the maximum score of 180 seconds.

The water submersion test was administered on Day 4. The apparatus and procedure have been described in Experiment IV. Water temperature was 105 ± 1°F. Each *S* was weighted with a two-gram tail weight to 30 grams of body weight. Prior to testing, each *S* was weighed and treated according to its drug treatment group. Time to submersion was determined one hour ± 10 minutes after drug injection.

3. *Results and Discussion*

The analyses of variance for the water runway data were computed separately for each of the three days utilizing a repeated measurements design. Even though Days 1 and 3 did not include drug treatments, the treatment groups were kept separate and treatment was included as a main effect in these analyses. For Day 1, there were no significant differences in the latency to escape between coat-color groups or between treatment groups. Swimming speed to escape from the runway improved significantly over the three trials ($F = 25.68$, $df = 2/270$, $p < .01$). For Day 2, drug treatments resulted in significant effects ($F = 4.69$, $df = 4/135$, $p < .01$), but no significant effects were found for coat color. However, there were significant coat color × drug treatment ($F = 2.23$, $df = 8/135$, $p < .05$) and drug treatment × trial

($F = 3.00$, $df = 8/270$, $p < .01$) interactions. Comparisons between the individual mean latencies of the drug treatment groups by the Newman-Keuls method (28) showed that the group receiving d-amphetamine at the 20 mg per kg dosage took significantly ($p < .05$) longer to escape from the water runway than either the noninjected or distilled water injected control groups. When the individual means of the color groups were compared, there were no significant differences. The two significant interactions are presented graphically in Figure 4 (A and B). The coat color × drug treatment interaction (Figure 4A) was the result of the differential effect of the white mice requiring more time to escape from the water runway than the black or brown *S*s administered 10 mg per kg of d-amphetamine. Similarly at the 20 mg per kg level of dosage, the black *S*s required more time than did either the brown or white mice. The drug treatment × trial interaction (Figure 4B) was due to the lack of a systematic decline in time required to escape from the water runway for the drug groups over trials.

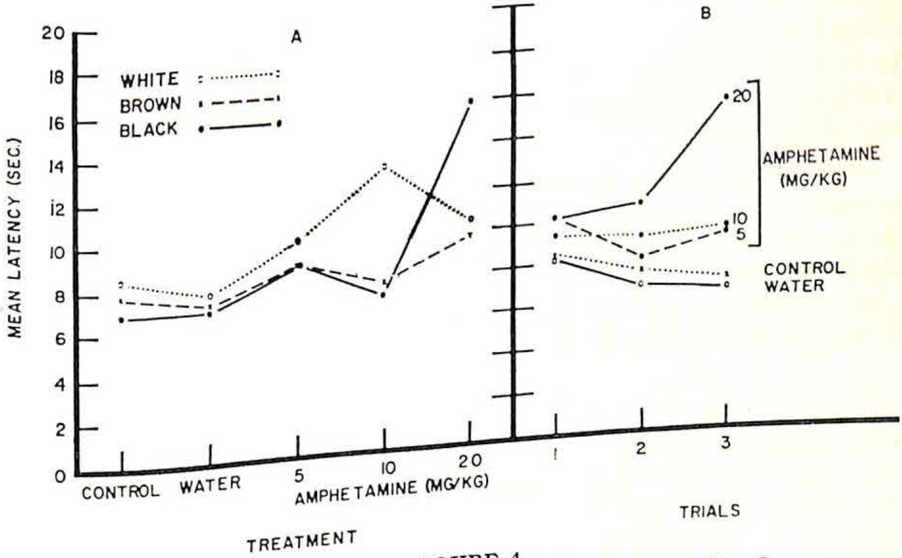

FIGURE 4

Mean Latency on Water Runway for Mice from a Four-Way Cross with Different Coat Colors Treated with Various Levels of Amphetamine
A = treatment × coat-color interaction and B = treatment × trial interaction.

For Day 3, there were no overall significant differences between coat-color groups, or between treatment groups in swimming speed to escape from the runway. The effect of the drug treatment of the previous day showed no carry-over effect. However, individual mean comparisons between coat colors by the

Newman-Keuls method showed that white *S*s had significantly ($p < .05$) longer latencies than brown or black *S*s. The analysis of variance of the time to submersion scores on Day 4 revealed no significant effects of either coat color or drug treatment on this survival measure.

In general, the results of this experiment indicated that differences in coat color between mice of a four-way cross were not related to performance on an escape from water runway task when tested with d-amphetamine. This drug, at the higher levels of dosage, resulted in animals requiring a longer time to escape from the runway, but had no effect on the water submersion task.

The potential use of a swimming task as a behavioral measure to assay the effects of amphetamine was stimulated by the report of Smith and Beecher (21) and the review by Weiss and Laties (23) which showed that amphetamine enhanced swimming performance in humans. The data from other experiments with animal *S*s, in addition to the data presented here, fail to clarify the picture. In water submersion tests with mice, Jacob and Michaud (7) failed to find effects in time to exhaustion with doses of amphetamine from 6.25 to 50 mg per kg, while Nieschulz (18) reported that 5 mg per kg of amphetamine shortened time to exhaustion and 1 mg per kg failed to have an effect. Bättig (1) found that 1.5 mg per kg of amphetamine resulted in a small improvement in time to submersion in rats. A dose of 4 mg per kg produced a significant improvement in increased time to submersion. In a water runway task permitting the animal to escape, Bättig (1) found that rats administered amphetamine showed a paradoxical effect to impair performance and increase swimming time to escape. Kiplinger, Abreu, and Roush (11) found that dosages of amphetamine between 2 to 8 mg per kg given to mice decreased fatigue and improved performance. A dose of 16 mg per kg increased fatigue and impaired performance on this task. It is apparent that an animal's response to amphetamine is complex, and probably dependent upon a host of variables, such as species, strain, age, and sex, as well as route of injection, delay between injection and testing, and characteristics of the performance task. Many of these variables and their interactions are not yet fully understood.

H. General Discussion

The general findings from this group of five experiments indicate that, in mice from a four-way cross representing three coat colors, the albino animals are different from their pigmented (brown or black) littermates. On every response measure except one, the albino mice could be considered to show "inferior" performance to the pigmented mice. The one exception was on the most stressful task, water submersion, in which the albino animals survived the "sink or swim" task longer than the pigmented mice.

It has been proposed that the albino gene may affect other systems, such as neurochemical processes, which directly mediate the observed behavioral differences. The skin of the albino animal is deficient in tyrosinase and dopa oxidase activity (3, 20). These enzymes are essential in the tryptophan-oxidizing system important for catecholamine metabolism. Whether these enzymatic deficiencies are found centrally in the nervous system as well as peripherally in the skin is as yet undetermined. There was a suggestion that albino mice of the BALB/c strain showed no difference in norephinephrine content, but did show an increase in serotonin levels of diencephalic areas as compared to pigmented C57BL/10J mice (12, 13).

It is evident that the neurobiology of the genetic relations of coat color and albinism on behavior is not only little understood, but that this area represents an important resource for experimentation and analysis. The general trend of inferior performance of albino *S*s, and the special effects on submersion measures are important findings. The authors expect that studies of inbred, heterogeneous, and mutant mice will elucidate the biological mechanisms. In this laboratory the authors are pursuing further the analysis of behavioral variation using samples of the four-way cross mice and their parental stock. The albino gene situated on a homogeneous or heterogeneous genetic background is an important biological variant of significant psychological importance.

I. SUMMARY

Adult male mice of black, brown, or white color representing a four-way cross were evaluated in several experiments: (*a*) open field testing for activity and emotionality, (*b*) learning of a two-barrier spatial or visual problem in a water tank set at 95°F, (*c*) learning of a two-barrier spatial problem in a water tank set at 55 or 75°F, (*d*) submersion time in water set at 105°F and with added tail weight of two grams to 30 grams of body weight, and (*e*) water escape and water submersion in response to administration of d-amphetamine.

Albino animals consistently performed worse than their pigmented littermates on all response measures except the water submersion task. These data support previous observations that behavioral characteristics segregate with genes determining coat color. Possible physiological mechanisms to account for these behavioral characteristics were considered.

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SOME INITIAL EVIDENCE FOR AN INTERPERSONAL RISK THEORY*[1]

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A. Introduction

When we speak of power and influence affecting relations between people, as a rule we rarely have been able to pinpoint what it is that we actually mean. What happens in such complex human social behavior obviously is very detailed and specific. One might say that lack of sufficient specificity in previous formulations of this problem has been a stumbling block to a better understanding of it. In an effort to sharpen understanding of this problem, Interpersonal Risk Theory (6) was formulated to account for specific causes and effects of power and influence in social relations between people. The present paper reports some initial data in support of the theory.

The main idea in Interpersonal Risk Theory (IR Theory) is that voluntarily an individual may choose to *give away* power and influence to others with whom he is in contact. The act itself is a form of allocation of personal resources to another. Such behavior is said to occur most readily whenever past actions of a similar kind have been rewarding. And, consequently, such behavior may be expected to lead to cooperation between people, the theory states, while the opposite form of behavior will lead to competition and conflict. Personal influence and control over another person thus consists in one person having certain resources that, potentially or actually, can lead to that control over another. Giving away or withholding the resources leads to reward or punishment and, subsequently, to various forms of approach or avoidance behavior. The resources can also vary a good deal, depending on the person and the place, and are far too numerous to list here. French and Raven (2) describe some important resources in terms of their categories of social power and list, for example, as major ones: reward power, coercive power, legitimate power (sanctions), and expert power (knowledge). Sanction and knowledge are exceptionally good examples of the forms of social

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[1] Dr. Douglas Schultz, Dr. Durand Jacobs, Dr. Rowland Shepard, and members of the staff of the Veterans Administration provided helpful encouragement and cooperation in the longer study on which this brief report is based.

power (resources) that, if given away to others, can affect social behavior profoundly. Delegation of authority and providing assistance in the form of giving useful information are known to increase performance and morale.

Since the consequences of giving away influence are often unpredictable, a degree of "interpersonal risk" attends each decision to so act. If a condition of mutual trust exists (each party sees little risk in a relationship with the other), such "IR behavior" is considered more likely to reoccur than in a condition of lack of mutual trust; and having reoccurred, such IR behavior serves to maintain or enhance mutual trust. IR theory states that a person's willingness to give away influence over others is based on a subjective calculation of personal risk and utility and serves as a principal determinant of attitudes, needs, and interpersonal behavior.

A distinction also needs to be made between subjective interpersonal risk, objective interpersonal risk, and environmental risk. Subjective interpersonal risk is a domain of behavior that refers to a person's willingness, based on subjective probability and risk taking, to give away influence over others. Acting on this willingness is called subjective interpersonal risk behavior. Viewed as an antecedent condition, subjective IR behavior should, for example, predict many forms of social behavior. High subjective IR behavior should be correlated with trust. As a dependent variable, low or high subjective IR behavior is a function of prior conditioning by others who have themselves acted in a low or high IR fashion. Patterns of low or high subjective IR behavior are thus undoubtedly serial in order with recent antecedent IR conditions being key factors in the prediction of consequent IR behavior.

Objective interpersonal risk behavior designates that form of IR behavior taking place in the actual social interactions between two people and is viewed apart from their subjective frames of reference. It can be described as that which two or more people are actually doing to or for each other at a given moment, in addition to what they think they are doing to each other. A concept like objective interpersonal risk is apparently needed to explain the interaction process itself in addition to each individual's private view of it.

Actual risk conditions in the physical environment in which an interaction takes place form another set of conditions that can be said to covary with the subjective and objective domains described above. Varying conditions of risk and threat in the physical environment may be expected to affect the perception of the amount of interpersonal risk that it is feasible to take in a given situation and the actual interpersonal risk behavior that takes place in the interaction itself.

B. PROBLEM

The present information was obtained from questionnaires administered to personnel in a large psychiatric hospital. No effort was made at this stage to examine directly the risk element in the theory. Only indirect evidence for this element is given in the correlation between the IR scale and the Dilemmas of Choice scale. What is measured directly is the willingness to give away influence (the first part of the theory). The items in the IR scale are to be submitted to a different scaling procedure that will measure directly the risk element as well as the willingness to give away influence. These present data form a separate analysis and report of data from a larger study (4).

This approach used methods developed for the construct validation of a test (1), and jointly seeks confirmation of a network of empirical relationships between scores on a test and scores on other instruments theoretically related. Such a confirmation of relationships, predicted by the theory underlying the test used, can serve also to validate a construct.

The first procedure was to assess the internal validity of items in a test (5) intended as a measure of the construct of subjective interpersonal risk. Previous unpublished analyses suggested that the IR scale items would prove adequate in item discrimination and scale reliability, that the distribution of obtained scores would be normal, and that the influence of response set would be minimal.

A second procedure was to determine the degree of correlation between several theoretically related constructs and subjective interpersonal risk by correlating responses to the IR scale with responses to other tests described later on. In its present form the IR scale was expected to be positively correlated with scores reflecting trustful, accepting, and adaptable, sociably group dependent behavior, being confident and self-secure, as well as being inclined to take risks. A negative correlation was expected with scores on a test of dominance, aggression, and competitiveness.

In a third procedure, correlations were obtained between responses to the subjective IR items and certain personality characteristics. It was expected that subjective IR scores would be correlated positively with scores on a test of the need for deference and negatively with scores on the same test measuring also the needs for achievement and for autonomy. Positive relationships with measures of the composite factor of morale and with measures of social distance towards mental patients were also predicted for the reasons given by the theory.

Finally, possible group differences on several demographic variables for subjects revealing different levels of subjective interpersonal risk behavior were checked as the fourth validation procedure.

C. METHOD

A sample of 92 subjects was drawn systematically from the staff of the Brecksville Veterans Administration psychiatric hospital in Brecksville, Ohio. In July 1966 when the data of the study was collected, 1061 people were employed at the 1000 bed hospital. The sample included personnel from each major administrative division and professional service, and was judged fairly representative of the hospital staff as a whole demographically. Sampling was not random due to administrative restrictions, and each Service Chief was asked to request volunteers from his personnel to participate in the study. A willingness to participate, for whatever reason, therefore, must be considered when judging the subjects and their probable response set.

The occupational categories of the subjects proved to be quite diverse, ranging from professional to unskilled. Educational and ethnic backgrounds were also quite varied. Age ranged from 19 to 60, with the mean age of 40 years. The mean level of education was completion of high school, and the mean time spent working in contact with psychiatric patients was about four years.

Participants in the study filled out seven pencil-and-paper instruments which were administered to them in group settings for the most part. Instruments included a demographic data blank, a measure of manifest needs (abbreviated form of the Edwards Personal Preference Schedule),[2] a personality-traits questionnaire (abbreviated form of the Sixteen Personality Factors Questionnaire), a scale measuring social distance towards psychiatric patients, a set of semantic differentials jointly measuring morale, a measure of risk-taking tendency [adapted from the Dilemmas of Choice Scale developed by Kogan and Wallach (3)], and a Likert-type scale measuring subjective interpersonal risk (5).

The present form of the IR scale requires the respondent to indicate (on a 10-step modified Likert scale) the degree of his agreement or disagreement with each of 30 dichotomized statements. The statements describe situations where elements of subjective risk are involved and where personal influence is distributed or exchanged.

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[2] The Psychological Corporation advises in a personal communication that measures of needs, when derived from an abbreviated form, such as the one used in this study, may not have the same meaning out of context as they would if derived from the full length form. Specifically, they state that "since there is evidence to indicate that the item responses obtained to selected items isolated from the context of Edwards Personal Preference Schedule are not comparable to those obtained within the context, the results of this research cannot be considered applicable to the standardized complete form of the Personal Preference Schedule." This limitation should be considered when interpreting this set of data.

Two sample items of each kind are:

1. It is best to delegate authority and influence freely because you can never tell when you will discover someone with exceptional skills (high subjective interpersonal risk).

2. People have many good untapped resources, and to reach the resources you have to give them lots of room and influence to express their talents (high subjective interpersonal risk).

3. Unless you know a person very well it is best not to take any chances by giving them too much freedom and responsibility in your mutual work with them (low subjective interpersonal risk).

4. There is no such a thing as a good bet. You have to watch people carefully and take pains not to give them too much authority and freedom (low subjective interpersonal risk).

For 15 of the statements agreement is scored in the high IR direction, while for the other 15 items agreement is scored in the low IR direction. Disagreement with high IR statements is scored in the low IR direction and disagreement with low IR statements is scored in the high IR direction. The respondent's final score is the difference between the subtotal of scores for high IR statements and the subtotal for low IR statements.

Results from the procedure of determination of internal validity indicate that the present IR scale and the other instruments used in the study are quite adequate. For the IR scale, summing the items to form a total score appears justified (obtained mean item-total correlation of .49), and there is a moderate degree of interitem correlation (of 435 intercorrelations, 160 were significant). An internal consistency coefficient of .912 (Pearson split-half, corrected, N of 127) was computed for a separate reliability sample indicating that the IR scale is quite homogenous. The reliability sample included both college students and other adults. The distribution of observed IR scores was normal, and the effects of response set seemed minimal.

The measure of risk-taking tendency utilized consists of 10 items very similar to those in the Dilemmas of Choice Scale. Seven of them are essentially the same as in the original scale with minor rewording. The three new ones follow the same format, but introduce female "heroes" in the situations described (the original scale used all male heroes), and refer to situations more relevant to the life experiences of the general population (most of the original situations seem to be appropriate for respondents who have some college training).

Morale was measured as the sum of scores for semantic differential scales reflecting the respondent's evaluation of four aspects of his job situation [identified by Vroom (9) as key components of morale or job satisfaction]. These aspects are job content, work group (co-workers), supervision, and company (such features as wages, promotional opportunities, and hours of work). Each scale contains 16 bipolar adjectives chosen from those used by Nunnally (8) with the bipolar continuum divided into seven steps.

To measure social distance toward psychiatric patients, a scale composed of seven sets of Bogardus-type social distance statements was utilized. Each set refers to a specific social encounter between personnel and patients. The subject is asked to choose one of seven response alternatives from a given set. Scores for each of the potential 49 response alternatives were predetermined as the consensus of judges about how relationships may be present in the data.

Support is presumably also enhanced for the validity of empirical relationships if the distributions of obtained scores are reasonably normal and not unduly restricted in range. Table 2 presents information on the shape of the distributions obtained for this study's variables. A restriction of range for the IR scale to approximately the upper 60 per cent of the potential range of scores is evident. A similar restriction was found for the separate reliability sample. The distributions for the other variables are not restricted in range to any marked degree with the possible exception of Morale. In this case the restriction of range is a fairly typical finding [see Vroom (9)] and is apparently not a function of the particular setting or instrument employed in this study. All of the instruments exhibit an essentially normal distribution of obtained scores in that none of the medians is significantly different from its respective mean.

D. Discussion of Results

Test scores reflecting the personality attributes of trustfulness and risk-taking tendency seem to covary positively with scores reflecting subjective interpersonal risk behavior. Empirical support for the first part of IR theory and, indirectly, for the second part (risk taking) were initially and tentatively confirmed. The pattern of these relationships is logically and theoretically consistent. Information about this is contained in Tables 1 and 2.

Group Dependence was expected to covary positively with IR, while Dominance was to covary negatively with IR. These relationships were not confirmed. Very low correlations suggest apparently that subjective IR is unrelated in this particular instance to Dependence and Dominance and unrelated to their opposites, Self-sufficiency and Submission. Perhaps these bipolar dimensions taken by themselves really involve only indirectly the social act of voluntarily giving away influence over others, although it is hard to say precisely how at present.

TABLE 1
SUMMARY OF RESULTS

Correlation of IR Scale with	*N*	Predicted direction	Obtained correlation	Hypothesis supported	Level significance
Deference	46	+	—.0761	No	N.S.
Achievement	46	—	—.158	No	N.S.
Autonomy	46	—	—.191	No	N.S.
Morale	46	+	—.332	No	.02[a]
Social Distance	46	—	—.165	No	N.S.
Trust	46	+	.404	Yes	.02[a]
Group Dependence	46	+	.0092	No	N.S.
Self-Confidence	46	+	.218	No	N.S.
Dominance	46	—	.0071	No	N.S.
Risk Taking	46	+	.405	Yes	.02[a]
Age	92	—	—.0568	No	N.S.
Sex	92	+	.146	No	N.S.
Educational Level	92	+	.124	No	N.S.
Psychiatric Experience	92	+	—.183	No	N.S.
Level of Supervision	92	+	—.146	No	N.S.

[a] Two-tailed test.

TABLE 2
DISTRIBUTIONS OF VARIABLES

Variable	*N*	Mean	Standard deviation	Potential range	Obtained range
Subjective Interpersonal Risk	46	12.88	1.95	1-19	9-18
Deference	46	14.37	4.02	1-28	6-22
Achievements	46	14.83	4.29	1-28	6-23
Autonomy	46	11.26	2.98	1-28	7-20
Morale	46	88.33	33.93	1-384	13-161
Social Distance	46	26.20	12.17	5-87	10-56
Trust	46	15.52	5.21	1-40	8-27
Group Dependence	46	19.50	5.02	1-40	6-31
Self-Confidence	46	19.06	7.33	1-52	7-41
Dominance	46	20.15	6.01	1-52	6-33
Risk Taking	46	63.96	15.77	1-100	25-96
Age	92	39.52	10.66	18-70[b]	19-60
Sex[a]	92	7.77	2.50		
Educational Level	92	3.36	1.36	1-6	1-6
Psychiatric Experience	92	50.91	60.54	0-240[b]	0-240
Level of Supervision[a]	92	8.04	2.45		

[a] Dichotomous data, score of 5 or 10.

[b] Estimates based on VA hiring and retirement practices.

An interesting finding is that Morale was significantly related to subjective IR behavior, but in the opposite direction to that predicted by the theory. Under these circumstances, a reason might be that Morale is in fact actually low and the subjects expressing high levels of subjective IR simply gave evidence of disappointment toward their jobs. A conflict may exist between expectation and reality for people who initially expect a work environment in which there is a high level of objective IR behavior, reflected in supervision; and when they find in reality it is not, this may result in formation of a less favorable evaluation of their work environment.

Both of these possible explanations offered for the reversal of the predicted Morale-IR relationship suggest that factors, such as poor administrative practices and a constrictive work environment, may cause a person to lose influence over others involuntarily (freedom is taken away in supervision) and to behave in ways otherwise not chosen (6, p. 8). An individual may, unfortunately, come to expect far more opportunities for voluntary action than are provided by an organization. Based on such subjective factors as personal values and level of aspiration, a person who has an unrealistically high subjective IR level relative to actual conditions may suffer greatly, and this will be reflected in attitudes toward the organization. This is also an example of the possible outcome of variations in risk in the subjective, objective, and environmental domains. Such variations are not without their potential dangers for the individuals.

A direct empirical link between subjective IR behavior and the needs measured in this study was not found. Eventually this link will have to be examined systematically, since the theory assumes that complicated needs, attitudes, and personality factors, such as self-esteem, are necessary to explain subjective and objective IR behavior. An important question for IR theory is raised by its probable complex relation to other personality variables. To what extent and under what conditions are the variables, such as personality needs, positively or negatively linked to subjective and objective IR behavior? Subjective IR behavior is probably only one important determinant of objective IR behavior. Subjective interpersonal risk represents the individual's knowledge of and, to some extent, his evaluation of "what is out there." Factors of "what should be out there" and "what I wish were out there" may also enter into his evaluation of his social environment and thereby into his social acts. That is, such factors as needs, expectations, values, and aspirations would seem to be reasonable determinants of the evaluations expressed and behavior performed. The person's full assessment of the ongoing interaction in which he is involved, in terms of the personal risk and utility for him, is, therefore, probably only incompletely reflected in subjective IR scores alone.

One additional finding that suggests complex multivariable determinants for subjective IR behavior derives from a multiple regression analysis. Educational Level, Psychiatric Experience, and Supervisory Level, when combined, do correlate with subjective IR at a significant level. The combination of more education, shorter psychiatric experience, and being in a non-supervisory position is associated with having a higher level of subjective interpersonal risk.

The main limitations of framing research questions in the conjunctive form (correlational form) are that less information is available about the direction of a relation and the serial effect of one variable on another (7). For this reason, further study of the construct of interpersonal risk should be somewhat more deterministic and experimental, with investigators using hypotheses expressed in the conditional "if, then" form. Certainly the direct and indirect effects of subjective IR behavior and objective IR behavior on a variety of human conditions will be an interesting area into which to look in the future.

E. SUMMARY

Individuals may choose voluntarily to give away influence and power to others and may do so in a variety of human social relations. The act of so doing is said to be based upon a degree of personal risk and its assessment by the individual. An explanation offered for this behavior is called "Interpersonal Risk Theory" (6).

A correlational study of personnel in a large organization showed that measures of subjective interpersonal risk behavior correlate significantly and positively with measures of trust and risk taking and that a strong negative correlation exists with measures of morale. There is some evidence also that subjective interpersonal risk behavior as presently measured is correlated positively with self-confidence. Its negative relation to morale in the present setting and its positive link in a multiple regression analysis to combined demographic variables attests to the complex determinants of the concept.

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COMMUNICATION AND CONTRAST: A CASE OF CHANGING SOCIAL PERCEPTION BY INDIRECTION*[1]

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A. INTRODUCTION

It has been well established in psychophysical experimentation that the value of a stimulus on an attribute may be changed as a result of its being presented in the context of other stimuli with extreme values on that attribute [e.g., Dember (1)]. This result has been called *contrast* or an anchor effect.

Research studies dealing with contrast effects produced by communication have been concerned with contrast as a function of the discrepancy on an attitude dimension between the position advocated by the communication and the positions of members of the audience (4): i.e., the position a person perceives to be advocated by a communication is a function of his own position in relation to the position actually taken by the communication. Contrast is characterized by the perceived position of the communication being "pushed" away from the person's own position. In other words, the difference between his position and the position advocated by the communication is perceived to be appreciably greater than it actually is.

Another phenomenon, the reverse of contrast, has been noted and discussed by Sherif and Hovland. They call this phenomenon *assimilation*. Assimilation is characterized by the perceived position of the communication being "pulled" toward the person's own position, so that the difference between the two is perceived to be appreciably less than it actually is.

The concept of assimilation bears a striking resemblance to the concept of stimulus generalization developed by Hull [as reported in Hilgard (2, p. 140)].

This paper is addressed to an analysis of a somewhat different phenomenon, yet one that nevertheless may be considered in theoretical terms similar to those employed by Sherif and Hovland. The concern of this study is the

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[2] The data were gathered while the author was with the Graduate School of Journalism, Columbia University.

general proposition that a communication may change perceptions of stimuli not presented in the communication through contrast with or assimilation to stimuli provided in the communication.

B. METHOD

As part of a course in newswriting, Malcolm X, erstwhile Black Muslim (BM) leader, now deceased, was invited to hold a press conference for a class of journalism students. At that time, Malcolm X was still the "national representative" of Elijah Muhammed, the leader of the BM movement.

This situation was employed to gather data which were relevant to the proposition stated above. A form of the semantic differential was used to measure perceptions of both the BM and the National Association for the Advancement of Colored People (NAACP) before and after the press conference. Exigencies of the situation (the press conference was not held primarily for research purposes) made it necessary to administer the *before* measurement just a few hours prior to the press conference. An innovation was attempted in the presentation of the semantic differential to the subjects. Fifteen bipolar scales were read aloud to the assembled students. Each student was given two blank sheets and asked to draw a grid on each one, forming 15 lines and seven columns. The lines were lettered A through O, and the columns were numbered 1 through 7. In this manner subjects constructed the 15 seven-interval scales.

The students were told that they should respond to the first word-pair read to them on line A by putting an X in the box which most nearly represented their feelings. They were told further that in responding to each word-pair, they should consider the first word of the pair read to them to be represented by the left-hand end of the scale, where the end box was numbered 1, and the second word read to them to be represented by the right-hand end of the scale, where the end box was numbered 7. Students were also told that if they could not decide how to mark a particular scale, they should write *NO* on that line. Scales were read to them at a rate of about one every five seconds. They responded to the BM as a concept first, and then to the NAACP. Students were told that their responses would be analyzed confidentially to aid in an evaluation of the effectiveness of the press conference.

Seventy-four students participated in the study. Since all the students were required to attend the press conference, it was not possible to use a control group. However, since only about six hours passed between the *before* measure and the *after* measure, it could be assumed that any systematic differences between these two measures resulted from the press conference. Conceivably some change in perception might have occurred as a result of students talking to one another between the administration of the *before* measure and the time of the press conference. However, there was not much opportunity for conversation to take place, and these changes should have been more or less random. After the press conference, students had no chance to talk to one another before the *after* measure was taken. The *after* measure involved the same set of 15 bipolar items administered to the subjects in the same manner as the *before* measure.

Without the use of a control group, the question of statistical regression arises as a possible explanation for shifts on the semantic differential. It will be shown in the discussion, however, that statistical regression cannot be adduced as the sole explanation for the findings.

At the press conference, Malcolm X was introduced as the "national representative of Elijah Muhammed" and "one of the most articulate spokesmen of the Muslim movement." It was, of course, impossible to know exactly what he would say ahead of time, since this was a real life situation and not a planned experiment.

Malcolm X definitely dominated the press conference. His presence was commanding. He was neatly dressed in a business suit and spoke with a strong, unfaltering voice. His appearance and manner conveyed self-assurance, conviction, and vitality. His statements were to the point, but he did not insult the students. His opening remarks dealt exclusively with the background and beliefs of the BM.

He did not refer to any other Negro organization by name, though he did make several references to Negro civil rights leaders in general. He once referred to the "Big Six" and at another time to Roy Wilkins, without identifying him as an official of the NAACP. His references to Negro civil rights leaders were never approving and usually denigrative. For example, he said that "most Negro integrationists are nothing but beggars," contending that the Negro will never be more than a "beggar" as long as he has to ask the white man for civil rights. He quoted Elijah Muhammed as saying that the present Negro leadership in this country is "riding a tiger" that it cannot control. Because Malcolm X did make these references to civil rights leaders, it cannot be argued that all changes in perception of the NAACP were necessarily brought about indirectly. However, the data showed that the nature of most of these changes could not be explained as direct results of these references.

How would one expect contrast to operate in this press conference setting? Perceptions of the BM in this case may be conceived as anchors to perceptions of the NAACP. In understanding the contrast paradigm as it has been extrapolated to this situation, it is important to remember that a function of communication here is to establish the salience of the relation between perceptions of the two organizations or to establish the anchor, as it were. However, there very likely may be movement of anchoring perceptions as a result of the communication.

According to the paradigm, the more extreme is the anchor, the greater is the contrast effect. It follows that as the anchor becomes more extreme in one direction, the criterion perception will tend to shift further in the opposite direction. In measuring perceptions of the BM and the NAACP both before and after the press conference, it was possible to determine the nature of shifts in both anchor and criterion perceptions. Eliciting perceptual responses to both the BM and the NAACP prior to the press conference may have served to establish the anchor to some extent, since perceptions of the BM were elicited first. However, the remarks of Malcolm X were considered at the very least to have focused and intensified perceptions of the BM and for some students to have made perceptions more extreme. Therefore, one would expect contrast to be much greater generally after the press conference than before. The hypothesis to be derived in the present case was that if an extreme perception of the BM on a particular attribute were reinforced or if a perception became more extreme, then the criterion, or the person's perception of the NAACP on that attribute, would tend to shift in the opposite direction, away from the anchor, showing an increase in the contrast effect.

For some students, perception of the BM may become less extreme on a particular attribute following the press conference. As the anchor becomes less extreme, the contrast effect would grow weaker, and the criterion perception would tend to shift toward the anchor. Here the conceptual waters become rather muddy. A lessening of the contrast effect is not necessarily a case of assimilation, yet one would expect the criterion perception to behave very much the same in either case. The only instance that might be unambiguously interpreted would be that in which the anchor *did not* become less extreme, but the criterion perception moved toward the anchor anyway. However, it was expected that in this press conference setting, contrast would be much more likely to occur than either assimilation or a lessening of contrast, given the essential characteristic differences between the BM and the NAACP.

C. Results

Table 1 shows the mean responses on the 15 bipolar scales to the NAACP and the BM both before and after exposure to Malcolm X. It can be seen that the students had a tendency to consider the NAACP in a favorable light prior to hearing Malcolm X. The mean response on the BAD-GOOD scale was 5.74, but it was highest on the DISHONEST-HONEST scale at 6.09. Both of these scales are heavily loaded on the evaluative factor (3). The lowest rating for the NAACP was 4.05 on the MODERATE-EXTREME scale, and that was a neutral position.

TABLE 1
MEAN RESPONSES TO THE NAACP AND THE BM BEFORE AND AFTER EXPOSURE TO MALCOLM X

	NAACP				BM		
Scale	Before	After	Change	N[a]	Before	After	Change
BAD-GOOD	5.74	5.68	—.06	72	2.53	3.08	.55
WEAK-STRONG	5.03	4.92	—.11	70	3.73	4.22	.49
TIMID-BOLD	5.31	4.74	—.57	72	6.39	6.48	.09
UNFAIR-FAIR	5.18	5.62	.44	67	2.69	3.42	.73
PASSIVE-ACTIVE	5.70	5.23	—.47	73	5.69	5.92	.23
INCOMPETENT-COMPETENT	5.36	5.41	.05	64	3.90	4.27	.37
DISHONEST-HONEST	6.09	5.79	—.30	63	4.23	4.61	.38
UNFRIENDLY-FRIENDLY	5.00	5.42	.42	65	1.79	2.55	.76
UNREASONABLE-REASONABLE	5.22	5.39	.17	64	2.23	2.81	.58
UNINTELLECTUAL-INTELLECTUAL	4.91	5.30	.39	67	2.53	2.96	.43
CRUEL-COMPASSIONATE	5.36	5.35	—.01	66	2.97	3.21	.24
POOR-RICH	4.26	4.75	.49	54	3.28	3.38	.10
INFLEXIBLE-FLEXIBLE	4.27	4.92	.65	71	1.60	1.84	.24
MODERATE-EXTREME	4.05	3.34	—.71	74	6.20	6.57	.37
UNMILITANT-MILITANT	4.56	4.26	—.30	73	6.20	6.23	.03

[a] The number of students who gave a full set of responses, including before and after measures, for both the NAACP and the BM.

Generally, the NAACP was considered to be a little bold, a little on the strong side, with a tendency toward fairness, rather active, tending toward reasonableness and compassion. This organization was perceived further as neither rich nor poor, flexible nor inflexible, about middling on militancy, and only slightly on the intellectual side.

The BM, however, were perceived primarily in an unfavorable light prior to the talk by Malcolm X. The lowest ratings for this organization were

1.60 and 1.79 on the INFLEXIBLE-FLEXIBLE and UNFRIENDLY-FRIENDLY scales respectively. The students tended to consider this organization as very bold, fairly active, and quite extreme and militant. The BM were perceived as more or less negative on all the other scales with the single exception of the DISHONEST-HONEST scale, on which they were more or less neutral. It can be seen in Table 1 that the BM were considered to be substantially lower than the NAACP on every scale except those involving boldness, activity, extremity and militancy.

In an examination of the changes in perception that occurred, the BM will be considered first. It is rather striking that every mean change in perception of the BM, including all 15 scales, was toward the upper end of the scale. It is evident that there was a general tendency for perceptions of the BM to grow increasingly favorable. The biggest changes were on the UNFAIR-FAIR and the UNFRIENDLY-FRIENDLY scales, with shifts of plus .73 and plus .76 respectively. There were also relatively large shifts on the BAD-GOOD scale and the UNREASONABLE-REASONABLE scale, with plus .55 and plus .58 respectively. Further, the BM had gained in strength, competence, honesty, and intellect. They were also perceived as more extreme.

The most pronounced change in perception of the NAACP was on the MODERATE-EXTREME scale, with a minus .71 change score. When the BM and the NAACP are compared, it can be seen that, if anything, the BM were viewed after the press conference as more extreme than before the press conference, and the NAACP was viewed as more moderate. This shift in perception of the BM is particularly striking in view of the initial mean rating of 6.20, which left very little room for a change in a positive direction. The relatively large shift toward the MODERATE end of the scale for the NAACP is consistent with the contrast hypothesis.

Another relatively pronounced change in perception of the NAACP was on the INFLEXIBLE-FLEXIBLE dimension. The NAACP was perceived as more flexible than it was prior to Malcolm X's talk, with a change score of plus .65. The BM was perceived as slightly more flexible also than before Malcolm X's talk, moving from 1.60 to 1.84, a change of plus .24. In spite of the fact that both of these changes were in the same direction, the change in the anchoring perception was less than that in the criterion perception. This suggests that here also was a case of contrast, since the scalar distance between the anchor and the criterion perceptions was greater following the press conference than before.

Two other instances of change in perception of the NAACP that were opposite in direction to those corresponding changes for the BM occurred on the TIMID-BOLD and the PASSIVE-ACTIVE scales respectively. Both of these scales offer examples of shifts in perception that suggest the contrast paradigm. In both cases, perception of the anchor stimulus, already rather extreme, became more extreme; and perception of the criterion stimulus shifted in the opposite direction, away from the anchor stimulus.

Other examples of shifts in perception which were consistent with the contrast paradigm were found on the UNMILITANT-MILITANT scale and the POOR-RICH scale. The NAACP was perceived as less militant and richer after the press conference than before.

Shifting responses on the DISHONEST-HONEST scale presented a unique pattern among the scales. The shift in perception of the NAACP was in the opposite direction from that of the BM. However, the mean perceptions of the two organizations were considerably closer together after the shift than before, suggesting the possibility of assimilation as an interpretation. An alternative explanation, and perhaps a better one, would be simply that a lessening or weakening of the contrast effect had occurred. This might be a better explanation than assimilation because the mean perceptions of both organizations shifted, and the distance between them after the shift was still relatively large—1.18.

Other scales which showed appreciably large shifts in perception of the NAACP were UNFAIR-FAIR, UNFRIENDLY-FRIENDLY, and UNINTELLECTUAL-INTELLECTUAL. However, on each of these last three scales, the shift in perception of the NAACP was in the *same* direction as that of the BM; and the scalar distance between the anchor and the criterion perceptions was less following the press conference than before.

There may have been a ceiling effect obscuring shifts toward the near end of a scale where perceptions were already extreme. In view of this, it was decided to examine direction of change in perception without regard to the scalar distance of change. Table 2 shows these results, which tend largely to confirm the data presented in Table 1.

The data discussed so far, though suggestive, were rather weak support for the contrast hypothesis. A far stronger type of data came from an examination of the patterns of changing perceptions for individuals, rather than for the group of students as a whole.

A person's position on a scale may change in one direction or the other, or it may not change at all. It was assumed that if contrast effects were not present, a shift in perception of the NAACP was as likely to move in one direction as the other.

TABLE 2
FREQUENCY OF CHANGES IN RESPONSE BY DIRECTION FOR BOTH THE NAACP AND THE BM

Scale	NAACP <—	NAACP —>	NAACP No change	BM <—	BM —>	BM No change
BAD-GOOD	11	8	53	9	30	33
WEAK-STRONG	19	17	34	10	28	32
TIMID-BOLD	36	14	23	11	10	52
UNFAIR-FAIR	11	30	26	7	39	21
PASSIVE-ACTIVE	31	12	30	13	21	39
INCOMPETENT-COMPETENT	16	19	29	15	32	17
DISHONEST-HONEST	21	12	30	13	21	29
UNFRIENDLY-FRIENDLY	15	29	21	10	35	20
UNREASONABLE-REASONABLE	19	33	22	15	34	25
UNINTELLECTUAL-INTELLECTUAL	14	26	27	14	28	25
CRUEL-COMPASSIONATE	15	18	33	18	28	20
POOR-RICH	10	25	19	10	18	26
INFLEXIBLE-FLEXIBLE	13	41	17	9	20	42
MODERATE-EXTREME	40	12	22	9	10	55
UNMILITANT-MILITANT	33	20	20	21	12	40

To illustrate this analysis, the MODERATE-EXTREME dimension may be considered. An examination of individual responses toward the BM showed that 56 of the 74 subjects marked the 7-interval on the scale (the EXTREME end) prior to the press conference and that 49 of these 56 subjects did not change after exposure to Malcolm X. Furthermore, nine subjects had marked the 6-interval prior to the press conference, leaving only another nine subjects who did not mark either 6 or 7 initially.

To determine whether or not contrast was operating in this situation, the experimenter examined the changes in perception toward the NAACP for those subjects for whom contrast would be most likely to operate: i.e., those who had the most extreme perceptions of the BM initially and did not change (at the very end of the scale no change toward a still more extreme position could be measured) and those who shifted toward a more extreme position after hearing Malcolm X. A further condition necessary to the analysis was that the initial perception of the NAACP be free to move in either direction: i.e., that it be greater than 1, but less than 7.

There were 46 subjects who met these conditions on the MODERATE-EXTREME scale. Thus, given that there were only random shifts in perception of the NAACP among these subjects, one would expect, over a great many trials, that 23 of them would tend to move in each direction. It was found, however, that 36 of these 46 cases involved shifts in perception of the NAACP toward the MODERATE end of the scale. Applying a chi square test to the difference between the expected frequency of 23 and the obtained frequency of 36 yields a $\chi^2 = 14.70$, $p < .001$ by two-tailed test. Thus it was found that the MODERATE-EXTREME scale provided strong evidence of a contrast effect, with perceptions of the BM moving toward or clustering at the upper end of the scale, as anchor stimuli, and perceptions of the NAACP showing a strong tendency to move toward the lower end of the scale.

Table 3 shows the scales for which there was a contrast effect when subjected to analysis as described above. Besides the MODERATE-EXTREME scale, there was a contrast effect for TIMID-BOLD, PASSIVE-ACTIVE, FLEXIBLE-INFLEXIBLE, INTELLECTUAL-UNINTELLECTUAL and RICH-POOR (we ignore for a moment the fairness and friendliness scales). Thus, if we consider the eight scales in Table 1 that showed the greatest mean shift in perception of the NAACP, we find that six of them are listed here as showing a contrast effect. For these six scales, an examination of those individual cases most likely to show a contrast effect revealed a statistically significant shift in perception away from the anchor.[3]

It was mentioned earlier that some scales showed a shift in the same direction for both the BM and the NAACP. The UNFAIR-FAIR and the

TABLE 3

SCALES SHOWING CONTRAST EFFECT BY CHI SQUARE TEST, WITH LEVEL OF SIGNIFICANCE AND NUMBER OF CASES IN THE TEST

Scale	Level of significance	*N*
TIMID-BOLD	$p < .05$	33
PASSIVE-ACTIVE	$p < .05$	24
MODERATE-EXTREME	$p < .001$	46
INFLEXIBLE-FLEXIBLE	$p < .001$	39
UNINTELLECTUAL-INTELLECTUAL	$p < .05$	12[a]
POOR-RICH	$p < .05$	12[a]
UNFAIR-FAIR	$p < .01$	22
UNFRIENDLY-FRIENDLY	$p < .05$	19

[a] Chi square was corrected for continuity.

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[3] For two of these scales, it can be seen that the number of individual cases that could be included in the analysis was so small that chi square had to be corrected for continuity. The INTELLECTUAL-UNINTELLECTUAL and RICH-POOR scales were obviously marginal in their support of the contrast hypothesis and were included simply to show the extent of the evidence.

UNFRIENDLY-FRIENDLY scales both showed this type of movement, as can be seen in both Tables 1 and 2. When the shifts in perception toward both the BM and the NAACP were examined for individuals, this phenomenon could be seen even more clearly. Table 3 also shows the results of this analysis for these two scales, the only ones for which this movement was statistically significant.

The analysis may be illustrated through an examination of the UNFAIR-FAIR scale. Of 27 cases involving shifts in perception toward both the NAACP and the BM, only six involved shifts in opposite directions. Every instance of shifts in the same direction for both organizations was toward the FAIR end of the scale.

To test for a significant shift in the same direction for both organizations, each case for which there was a shift in perception toward the FAIR end of the scale for the BM and a shift in perception of the NAACP, though without reference to direction, was examined. As in the analysis of contrast described earlier, it was necessary for the initial position in respect to the NAACP to be free to move in either direction. There were 22 such cases.

The expected value in a chi square test may be taken as 11. It was observed, however, that there were 18 cases in which shifts were in the same direction for both organizations. Subjecting this difference between observed and expected values to a chi square test yielded $\chi^2 = 8.91$, $p < .01$ by two-tailed test. A similar analysis was conducted for shifts in perception on the UNFRIENDLY-FRIENDLY scale, producing a result significant at the .05 level. Thus it can be seen that for the two scales on which the largest shifts in perception of the BM occurred (.73 and .76 respectively), there were statistically significant shifts in perception of the NAACP in the same direction as that of the BM.

D. Discussion

It is tempting to conceptualize the cases in which perceptions toward the two respective organizations shift in the same direction as instances of assimilation. It might be argued that when a shift in perception of the BM was accompanied by a shift in the same direction toward the NAACP, there was a generalization of response. However, it is not the *change* in perception which is the response, but the perception itself. A shift in the perception of the two organizations in the *same* direction was not convergence.

Individual cases were closely examined to determine whether or not perceptions of the two organizations were tending to move closer together as they shifted. In most cases, where the shifting perceptions of the two organizations were in the same direction, the perception of the NAACP was being "pushed" from below toward the upper end of the scale. (For the sake of consistency, those cases where the initial perception of the NAACP was below the initial perception of the BM were not considered to fit the pattern unless the final perception of the NAACP was *above* the final perception of the BM.) On none of the scales examined was there any appreciable tendency for convergence to occur. It would seem, then, that perhaps something in the nature of contrast was also in operation here. It may be a contrast of a different sort from that which conforms to the psychophysical paradigm.

Osgood, *et al.* (3), in their development of the semantic differential, discovered that "semantic space" could be accounted for largely in terms of three factors: evaluation, activity, and potency. It is perhaps of some relevance here that those scales that showed a contrast effect in the traditional form tended to be those more heavily loaded on either the activity or potency factors than on the evaluative factor, whereas the two scales that showed the "other" phenomenon were essentially evaluative in nature. The POOR-RICH scale would seem to be the only exception, since it is primarily loaded on the evaluative dimension. It must be remembered, however, that the POOR-RICH scale offered at best only the most meager support for the traditional contrast hypothesis.

One might expect the contrast effect as traditionally conceived to operate more readily for activity and potency scales than for evaluative scales. In general, there is far less affect connected with activity or potency than with perceptions of goodness and badness and other evaluative attributes. It may be that the cognitive structures of subjects required the maintenance of a particular distance between evaluative perceptions of the NAACP and the BM. In other words, there seemed to be a kind of "locked in" contrast between the BM and the NAACP on the two dimensions of fairness and friendliness, such that an increase in perceived fairness or friendliness of the BM was accompanied by a corresponding increase for the NAACP.

There was another possible explanation besides contrast for the findings when individual cases were examined. Since only a fraction of the cases met the conditions for a chi square test, there was the possibility that regression toward the mean might account for shifts in perception of the NAACP. It can be said that regression may have influenced the results obtained if there was a tendency for the cases examined to move toward the distribution mean.

It can be seen in Table 4 that on all but one scale for which there was an apparent contrast effect, the mean shift in response of those cases that fit the contrast paradigm was in the direction of the mean initial response for all cases. However, for each of these scales, the shift was considerably greater than the discrepancy between the mean initial response of cases showing contrast and the mean initial response of all cases. For example, for the TIMID-BOLD scale, this initial discrepancy was .21, but the mean shift of cases showing contrast (31.9 per cent of the distribution on this scale), though in the direction of the mean initial response for all students, was *seven* times greater than the discrepancy. It is obvious that a shift of this magnitude could not be explained simply on the basis of regression toward the mean. Similar statements can be made for each of the other scales, except PASSIVE-ACTIVE. It can be seen that cases showing contrast on this scale tended to shift in the opposite direction from the initial mean of all students, precluding the possibility that regression produced the shift.

TABLE 4
Mean Initial Response to the NAACP of Students Exhibiting Contrast as Compared to the Mean Initial Response to the NAACP of All Students, Showing Magnitude and Direction of Mean Shift in Response for Students Exhibiting Contrast

Scale	(A) Mean initial response of contrast cases	(B) Mean initial response of all cases	(C) Mean after-response of contrast cases	(B)-(A)	(C)-(A)
TIMID-BOLD	5.52 (23)[a]	5.31 (72)[b]	4.04	—0.21	—1.48
PASSIVE-ACTIVE	5.53 (17)	5.70 (73)	4.24	0.17	—1.29
INFLEXIBLE-FLEXIBLE	3.48 (31)	4.27 (71)	5.16	0.79	1.68
MODERATE-EXTREME	4.44 (36)	4.05 (74)	2.66	—0.39	—1.77
UNINTELLECTUAL-INTELLECTUAL	3.80 (10)	4.91 (67)	5.40	1.11	1.60
POOR-RICH	3.60 (10)	4.26 (54)	5.00	0.66	1.40
UNFAIR-FAIR	4.50 (18)	5.18 (67)	6.11	0.68	1.61
UNFRIENDLY-FRIENDLY	4.28 (14)	5.00 (65)	6.00	0.72	1.72

[a] Numbers in parentheses are *N*s.
[b] These *N*s include all cases for which there were complete sets of responses.

There still remains the question as to whether or not the changes in perception of the NAACP might not be attributable directly to statements made by Malcolm X in the press conference. Considering his remark that "most Negro integrationists are nothing but beggars," one can see that a tendency toward agreement with this could lead to perception of the NAACP as more timid and passive than before. Furthermore, it could be argued that since passivity and timidity are generally undesirable qualities, the perception of the NAACP as possessing these traits would be consistent with the general tenor of Malcolm X's address. However, nothing that he said would have led directly to changes in perception of the NAACP as more moderate, more flexible, fairer, friendlier and more intellectual, all of which are considered generally to be positive characteristics.

E. SUMMARY

It was hypothesized that a communication may change perceptions of stimuli not presented in the communication through contrast with or assimilation to stimuli provided in the communication.

Data were gathered in connection with a press conference for journalism students which featured Malcolm X, who was at that time a spokesman for Elijah Muhammed, national leader of the BM. The remarks made by Malcolm X at the press conference constituted the communication. Perceptions of both the BM and the NAACP were measured before and after exposure to Malcolm X, using a modified form of the semantic differential presented orally. Since Malcolm X did not mention the NAACP in his presentation, it was hypothesized that perceptions of the NAACP would change as a function of the anchor produced by perceptions of the BM.

The data provided support for the hypothesized contrast effect and revealed another phenomenon that was also interpreted as contrast, though it did not conform to the contrast paradigm. There was no statistically significant tendency for assimilation to occur.

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A SCALE FOR MEASURING ATTITUDES TOWARD STUDENT HEALTH SERVICES*[1]

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A. Introduction

A number of studies of people's attitudes toward the utilization of health and medical services have appeared in recent years (1, 3, 6, 7, 8); however, the authors' review of the literature has failed to reveal any trend toward the development of reliable scales or indices for assessing the way people feel about their health-care facilities. Researchers sometimes base their conclusions concerning people's attitudes upon responses to a single question. In the best studies, of course, a careful attempt generally is made to measure attitudes toward health care; but, even in these cases, it is not unusual for the researcher to rely upon dichotomous responses to a small number of items. For example, Clausen, Seidenfeld and Deasy (2) utilized five items to measure attitudes toward a polio vaccination program; Freeman (5) utilized four items to measure attitudes toward mental hospitals; and Suchman (9, p. 322) employed three items to measure skepticism of medical care. It is the purpose of this paper to make available to others an attitude scale which was developed during an investigation of college and university students' attitudes toward their student health services. Although the statements comprising this attitude scale refer to a specific health-care context, the authors believe that the statements may be generalized considerably through slight modifications.

B. Method

The Student Health Services (SHS) scale was developed through the use of a modification of Thurstone's method of equal-appearing intervals (10). An initial pool of 450 opinion statements pertaining to student health services was provided by 90 undergraduate sociology students. This initial pool of items then was examined for overlap, and from this pool a set of 100 items was selected. These latter items were ordered randomly and submitted to 67 undergraduate student judges who were asked to indicate on a one-to-five scale whether a given statement pertaining to student health services was very favorable, was very unfavorable, was neutral, or was somewhere between these defined points. IBM answer sheets with five response categories were used, with a value of five being assigned when students believed the item to be very unfavorable. This procedure is recommended by Webb (11), who found a correlation of .99 between the scale values of the same 78 statements when they were judged by the Thurstone and Chave sorting method.

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After the judges had completed assessing the extent to which the selected statements were favorable or unfavorable toward university health services, medians and interquartile ranges were calculated for each statement. The medians defined the scale value of each statement (the lower the median, the more favorable the statement), and the interquartile ranges defined the degree of ambiguity. The SHS scale was formed by taking the 20 items with minimum ambiguity and approximately equal-interval distributions of scale values along the possible range from 1.00 to 5.00. Those statements whose scale values were in the interval 2.50 to 3.50 were excluded, following Edwards (4), on the grounds that such "neutral" statements are irrelevant. One's ability to locate a respondent on an attitude continuum is not improved by knowing whether he endorses a statement that is neither favorable nor unfavorable toward the attitude object.

C. Results

The items comprising the SHS scale, their scale and *Q* values (medians and interquartile ranges, respectively), and some identifying numbers appear in Table 1.

The identifying numbers shown in Table 1 signify the random order in which the scale items have appeared in the present research. The items of the scale are arrayed in Table 1 from most unfavorable to most favorable. Respondents are asked to indicate (by circling one of the five choices: Strongly Agree, Agree, Undecided or Uncertain, Disagree, or Strongly Disagree) the extent to which they agree or disagree with each of the 20 scale items. Arbitrary weights of 1, 2, 3, 4, and 5 are assigned to the five response choices. When a given scale item is favorable (scale values 1.00 to 2.50), a response of Strongly Agree is given a weight of 5 and a response of Strongly Disagree is given a weight of 1. The weights are reversed if the scale item in question has been judged to be unfavorable (scale values 3.50 to 5.00) to student health services. A respondent's attitude score is calculated by summing the weights

TABLE 1
STUDENT HEALTH SERVICES (SHS) SCALE

Position in SHS scale	Item content	Scale value	*Q* value
1	The doctors at the Student Health Center are incompetent.	4.96	.55
9	The doctors at the Student Health Center are careless in their diagnoses.	4.90	.60
11	If the Student Health Center didn't have a captive clientele, it would go out of business.	4.85	.65
12	The doctors at the Student Health Center prescribe medications that are largely outdated.	4.70	.96
2	The personnel at the Student Health Center treat students as immature children rather than as adults.	4.59	1.07
18	Since the patient pays for services before they are rendered at the Student Health Center, his demands or preferences seldom receive any consideration.	4.46	1.05
4	Patients' requests are frequently ignored at the Student Health Center.	4.25	1.04
13	The procedure for making an office call at the Student Health Center is an unnecessary inconvenience.	4.04	.66
14	The personnel at the Student Health Center tend to believe that too many students come for help for nonexistent illnesses.	3.90	.72
20	Students who can afford the expense consult private physicians for their medical care.	3.67	1.42
16	The services provided by the Student Health Center are quite adequate for minor illnesses.	2.23	1.44
10	There is really no difference in the Student Health Center and any other hospital or clinic.	2.16	1.59
7	The Student Health Center provides adequate medical care at minimum expense.	1.90	1.01
5	One never feels rushed during an office call at the Student Health Center.	1.79	1.22
19	The Student Health Center has the advantage of providing immediate attention, thereby eliminating long waiting periods in the office of a private physician.	1.62	1.15
17	The nurses at the Student Health Center are well trained.	1.39	1.05

TABLE 1 (*continued*)

Position in SHS scale	Item content	Scale value	Q value
3	The doctors at the Student Health Center seem to be abreast of the latest medical developments.	1.31	1.05
15	Having specialists available for consultation at little or no extra cost to the student results in a superior quality of medical care at the Student Health Center.	1.20	.84
8	The doctors at the Student Health Center show genuine interest in their patients.	1.13	.63
6	The Student Health Center provides excellent medical care for university students.	1.04	.55

corresponding to his 20 choices; thus, the SHS scores may range from a low (most unfavorable) of 20 to a high (most favorable) of 100.

Figure 1 shows the distribution of the 20 items included in the SHS scale through the four intervals included in the scale. While graduation is not perfect, there are no marked gaps. The absence of items with scale values in the extreme half-intervals (.50 to 1.00 and 5.00 to 5.50) is a statistical artifact. No attempt was made to interpolate those values within the extreme half-intervals, since it would in no way have affected the choice of items selected for inclusion in the scale.

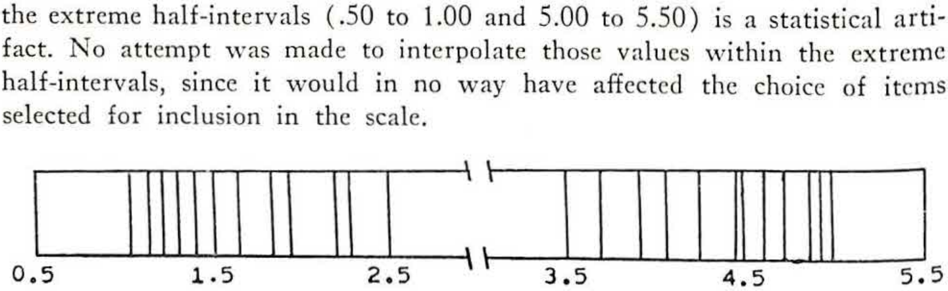

FIGURE 1
Distribution of Selected Items Through the Intervals

Figure 2 shows the relative ambiguity of the items included in the scale. While the items in the interval 1.50 to 2.50 have a somewhat higher mean Q-value than do the items in the other intervals, the difference is not great.

D. Summary

Recent studies of people's attitudes toward health services have failed to develop reliable scales or indices of those attitudes. The Student Health Services scale was developed through a modification of Thurstone's method of equal-appearing intervals. It consists of 20 items concerning various aspects of student health services—10 are favorable (scale values range from 1.04 to 2.23) and 10 are unfavorable (scale values range from 3.67 to 4.96).

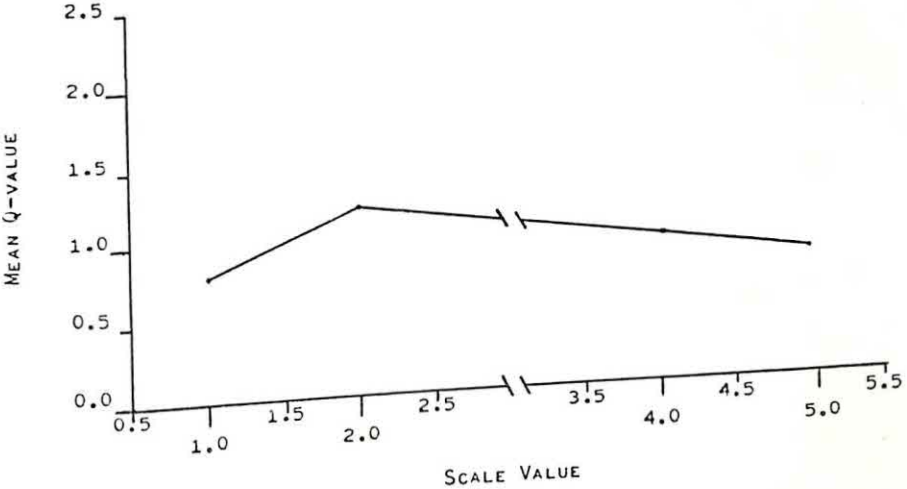

FIGURE 2
RELATIVE AMBIGUITY OF SELECTED ITEMS

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THE DELAY-RETENTION EFFECT IN CHILDREN: ROLES OF REWARD AND KNOWLEDGE OF RESULTS*[1]

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A. INTRODUCTION

Studies of *reinforcement* and of *knowledge of results* are typically regarded as belonging to two quite different domains. Thus, animal psychologists investigating one or another parameter of reinforcement generally feel no compunction to attend to the literature on knowledge of results in human verbal or motor learning, nor do verbal learning specialists studying the effects of feedback always attend to the animal literature bearing on learning and extinction as a function of reward-punishment parameters.

Such a separation is both artificial and invalid. Reward and knowledge of results (KR) are not two distinct and separable things. The arrival of a reward automatically and necessarily informs the *S* that his response was correct—or, as Lewin (10) conceptualized the informative function of reward, that *S* should do the same thing on the next trial. Thus, for example, it is logically meaningless to design an experiment in which reward follows *S*'s response immediately but KR is delayed. In any study in which this procedure is used [e.g. (13, Group 5)], it must be remembered that reinforcement and feedback are mutually exclusive events only insofar as operational definitions have made them so, but that no amount of defining can prevent a reward, contingent on *S*'s being correct, from conveying information. Experimental studies of the informative role of reinforcement are notable for their rarity. The outstanding example of such a study is that of Egger and Miller (8), who used rats to investigate the effect of information redundancy on the acquisition of secondary reinforcement strength.

As far as feedback or information is concerned, for many human beings, though not for animals, knowledge of results is converted by *S* into self-administered, frequently covert, reward or punishment. (This point is considered later.) Conceptually, this reinforcing function of feedback is what

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* Received in the Editorial Office, Provincetown, Massachusetts, on March 20, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] This investigation was supported in part by USPHS Grants MH-5925 and MH-11363. The authors are grateful to the administration and faculty of the Denver and Englewood School Districts for their cooperation in this research.

Skinner (17) referred to in his analysis of the way in which *self-control* operates. Empirically, this problem has seen little in the way of investigation until the inception of a series of experiments by Marston and Kanfer. [A brief description of their studies on "self-reinforcement" as well as the most complete bibliographic listing currently available may be found in Marston (14).]

Recently, several studies have demonstrated a delay-retention effect: i.e., the facilitation of retention following reinforcement delay during learning (1, 2, 3, 4, 5, 6, 11). The reinforcement in these studies, most of which have used children as *S*s, has been a compound event consisting of a tangible reward, with its inevitable informational component, together with a separate source of KR. The purpose of the present experiment was to assess the relative effectiveness for retention of reward, KR, and informational redundancy—insofar as this is possible, in light of the considerations discussed above.

B. METHOD

1. *Subjects*

The *S*s were 147 third-grade boys with an average age of 9½ years. They attended schools serving lower-middle to middle-class areas in the Denver metropolitan area. Subjects were randomly assigned to conditions, with one exception: the no-reward conditions were not run in the same schools as were the reward conditions in order to avoid the frustrating effects of inequality. The data for all *S*s who finished all three learning-relearning sessions have been included in the analysis of results.

2. *Design, Apparatus, and Procedure*

The design of the present experiment included eight conditions comprising different combinations of immediate, delayed, or no reward with immediate or delayed KR. The design can best be understood by first describing the procedure for Conditions 1 and 2 (Table 1), the standard or "nucleus" conditions used in most previous delay-retention effect studies.

The experimental task was a series of 18 two-choice discriminations. The material for this task consisted of line drawings of familiar objects. By randomization the drawings had been paired, the pairs ordered into sets for successive presentations, and the left-right position of the correct stimulus determined for each set. For half the *S*s one picture of each pair was correct; and for the other half, the other picture was correct.

From *S*'s view, the learning apparatus was seen as an upright piece of plywood with two identical columns of parts. From top to bottom, each column consisted of a pilot lamp, a stimulus aperture, a marble delivery chute, a marble receptacle, and a lever. Depressing either lever activated a timer, preset for the appropriate delay interval (zero or 10 seconds). If *S* pressed the lever under the correct stimulus, then, after the appropriate delay, the pilot light flashed on over that stimulus and a marble dropped into the receptacle. If *S* pressed the lever under the incorrect stimulus, the light over the correct stimulus flashed on. A second timer controlled the intertrial interval—20 seconds during all learning sessions and 15 seconds during relearning sessions. [The task and apparatus are more fully described in a previous article (2).]

TABLE 1
BASIC DESIGN OF EXPERIMENT[a, b]

Condition	Light	Marble	Reward	*N*
1	Immediate	Immediate	Yes	20
2	Delayed	Delayed	Yes	20
3	Immediate	Delayed	Yes	20
4	Immediate	Immediate	None	20
5	Delayed	Delayed	None	15
6	Immediate	Delayed	None	12
7	Immediate	None	None	20
8	Delayed	None	None	20

[a] "Immediate" and "delayed" = zero seconds and 10 seconds, respectively, between response and subsequent event.

[b] Experimental comparisons of interest are as follows: (*a*) standard condition for delay-retention effect—Condition 1 vs. Condition 2; (*b*) relative effectiveness for retention of reward vs. knowledge of results—Conditions 1, 2, and 3 vs. Conditions 4, 5, and 6; and (*c*) relative effectiveness for retention of informational redundancy in knowledge of results—Conditions 4, 5, and 6 vs. 7 and 8.

All *S*s were run individually in a private room provided by the school. Aside from the learning apparatus, the room contained a table on which was spread a standard array of 15 popular 10-cent toys. When *S* was brought to the room for the first learning session, he was asked to choose the toy he wanted to earn. His chosen toy was then put aside, with the explanation that he could win it by collecting enough marbles in the game. One pretraining item was given, to a criterion of three consecutive correct responses. Then, the list of seven pairs of items to be learned at this first session was shown to *S*, one pair at a time, and *S* was requested to name the pictured objects. Immediately after this, presentations of the discriminations began, following the predetermined random orders. On each trial *S* pronounced aloud the name of the object he thought was correct and pressed the lever under his choice. Whenever an item had been answered correctly on three consecutive trials—i.e., to criterion—it was dropped from subsequent presentations of the set. Then *E* asked if *S* would like to return next day "to play another game," gave *S* his toy, and returned him to the classroom.

The next day *S* again chose a toy to earn, named the objects in the 10 discrimination pairs still to be learned, and followed the same learning procedure to the same criterion. The relearning session was either one day or eight days after the second learning session. The child chose his third reinforcer, then relearned the 18 items from the first two sessions to the same criterion of three consecutive correct responses per item. Relearning was carried out under immediate reinforcement and a 15-second-intertrial interval. This shift in conditions for reinforcement delay groups has been found not to affect relearning scores significantly (2, Control B).

The methodology just described is that used in the original experiment (2) and, with minor elaborations, in subsequent studies of the delay-retention effect. It is represented in the present experiment by Conditions 1 and 2 (Table 1). Under Conditions 3-8, the only departures from the basic procedure consisted in whether the child did or did not receive a marble for a correct response and in whether he was or was not offered the chance to work for a toy.

Operationally, for the purposes of this study, the light flash following each answer is defined as a source of KR. The marble is defined as a source of KR in the no-reward conditions, and as a source of both KR and secondary reward in the conditions where a toy is earned during each session. It should be emphasized that setting reward apart from KR in these definitions depends only on the presence or absence of a prize with economic value.

C. Results and Discussion

A preliminary analysis was done to verify the occurrence of the delay-retention effect for the data of the present experiment. This involved a comparison of Conditions 1 and 2 (immediate reward plus KR vs. delayed reward plus KR). There was no significant difference between these conditions in mean number of errors to learning criterion—6.3 for immediately reinforced *S*s and 7.9 for *S*s run under delayed reinforcement ($t = 1.13$, $df = 38$, $p > .05$). These results accord with findings previously obtained from this project: out of 19 different experiments or separate experimental conditions in which we have compared the effect on learning of immediate reinforcement vs. delayed reinforcement, we have found no difference between the two conditions in 14 cases, significantly better learning under immediate reinforcement than under delayed reinforcement in two cases, and significantly better learning under delayed reinforcement than under immediate reinforcement in three cases.

For the same two conditions, a 2 × 2 analysis of variance of errors saved in relearning (immediate or delayed reinforcement and one-day or eight-day-retention interval) showed, first of all, that retention interval was significant as a main effect ($F = 4.47$, $df = 1, 36$, $p < .05$); and secondly, that the effect of delay on retention appeared not as a main effect but as an interaction term ($F = 5.54$, $df = 1, 36$, $p < .05$). That is to say, delay improved retention for at least 24 hours, but this effect dissipated at some point within the week following learning. These results are quite similar to those obtained in the original experiment. For example, in that experiment per cent of errors saved for the zero-second and 10-second-delay groups after a one-day-retention interval were zero and 79.12; in the present experiment per cent of savings for the two groups were 24.00 and 76.80. Rapid dilution of the delay-retention effect with time has been found to depend to a great extent on the difficulty of the learning task. With easy material or under easy learning conditions, as in the original and present experiments, the initial delay-retention effect is minimal and, moreover, dissipates quickly with time. With difficult material—e.g., low frequency bigrams (4) or when task difficulty is increased in some other way, as for instance when the *S*s are five-year-olds instead of nine-year-olds (3)—the delay-retention effect is both initially stronger and longer lasting than with easy material.

Of the main questions under investigation, the first concerned the relative effectiveness for retention of the components of reinforcement, reward, and knowledge of results. The top half of the body of Table 2, containing the results of this analysis, shows that the component of tangible reward does

TABLE 2

ANALYSES OF VARIANCE OF ERRORS SAVED IN RELEARNING[a]

Source	*df*	*F*
	Knowledge of results vs. reward: Conditions 1-3 vs. Conditions 4-6	
KR vs. reward (K)	1	5.41*
Retention interval (I)	1	19.96**
K × I	1	< 1
Error (*M*s)	103	(24.25)
	Redundancy in knowledge of results: Conditions 4, 5, and 6 vs. 7 and 8	
Redundancy (R)	1	1
Retention interval (I)	1	30.41**
R × I	1	1.12
Error (*M*s)	83	(27.14)

[a] A constant value was added to the scores in these analyses.

* $p < .05$.

** $p < .001$.

improve retention for the particular *S*s and situation under investigation. These restrictions on generalization, particularly that regarding *S*s, need to be emphasized.

Among the many ways human beings differ psychologically are the motivational characteristics they bring to a learning situation. Some human *S*s who are confronted by learning situations lack a "built-in" motivation to learn, so that *E* must supply some incentive along with KR in order for learning to take place. This is always the case for animals and human infants and is generally true for young children. In addition, it tends to be the case for those human beings who, regardless of developmental level, are characterized by low levels of need achievement motivation (12), low test-anxiety levels (16), and low socioeconomic class backgrounds (7, 9, 18). On the other hand, when the learner is "intrinsically" motivated to learn, *E* need not supply a reward for learning to take place—other than that privately bestowed by the learner on himself (14).

The first set of features is much more nearly characteristic of the children who served as *S*s in this experiment, while the second set describes more accurately the adults used by Lintz and Brackbill (11). In that study of the delay-retention effect, the authors found that both learning and relearning efficiency were utterly unaffected by the addition of a monetary reward to knowledge of results. Furthermore, it did not matter whether the money was given to *S* as a flat fee for his services or whether *S* believed that it was given him in a quantity directly proportional to the excellence of his performance.

The second question under investigation in this experiment was the effectiveness for retention of informational redundancy in knowledge of results. The outcome of an analysis of variance for redundancy is shown in the bottom section of Table 2. The nonsignificant effect of redundancy suggests that it is the news value of the information and not the total amount of information—in the sense of duplication or restatement—that is an effective predictor of amount retained. Egger and Miller (8) reached a similar conclusion in a dissimilar situation. Using rats in a performance (bar pressing) procedure, Egger and Miller hypothesized that ". . . reward occurs primarily at the point at which new information is delivered" (15, p. 68). In their ingenious procedure, the amount of information conveyed by a reinforcing stimulus was varied. One stimulus, S_2, was either completely redundant with another stimulus, S_1, in predicting delivery of food pellets or else it was a more reliable predictor of food than was S_1. The results indicated that S_2 became a stronger secondary reinforcer when it conveyed new information than when it was completely redundant.

D. Summary

This experiment investigated the effects on retention of reward vs. nonreward and of informational redundancy in knowledge of results. In eight experimental conditions, 147 third-grade boys learned a series of discriminations under reinforcement delay intervals of zero or 10 seconds and were tested for retention either one or eight days later. Results showed retention to be improved by reward but not by redundancy. In addition, the delay-retention effect appeared after the short retention interval.

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NEWS NOTES

Under this heading appear selected items that are considered to be of special interest to psychologists.

The National Science Foundation, 1800 G Street, N. W., Washington, D.C. 20550 expects to reopen its Postdoctoral Fellowship program in October for awards to be made in March 1968. The Foundation also expects to reopen the Graduate Fellowship program for 1968-1969 in October 1967. Application forms will be available when the programs are announced.

* * *

The Governments of the U.S. and India have established a program for increasing the exchange of scientists and engineers between the two countries. In an agreement signed February 14, 1967, the two nations have undertaken to provide for increased cooperation between the scientific and technological communities of the two countries, looking toward mutual benefits from the program.

The national agencies responsible for the program are the National Science Foundation in the United States and the Council for Scientific and Industrial Research in India. Together, these agencies are developing guidelines that will govern the selection of participants. It is anticipated that the exchange visitors will be senior scientists and engineers who will make short-term visits to institutions for purposes of lecturing and consultation on scientific and technical matters. The visits will also enable scientists and engineers from these countries to establish personal contacts for further communication about problems of mutual interest.

The National Science Foundation will nominate approximately 10-20 outstanding American scientists and engineers to visit India each year. The Foundation will also arrange visits to American institutions for the Indian scientists and engineers nominated by the Indian Council for Scientific and Industrial Research.

* * *

The National Science Foundation has published additional information on the 1966 National Register of Scientific and Technical Personnel in *Reviews of Data on Science Resources,* No. 11, "Salaries and Selected Characteristics of U.S. Scientists, 1966."

The first preliminary results from the 1966 Register were reported in a December 28, 1966, press release. This second release of data on the 243,000 respondents to the National Register includes information on the numbers and median salaries of scientists in the physical, life, and selected social sciences; highest degree attained; type of employer; primary work activity; and age. A final report, with complete details, will be published later this year.

Copies of the bulletin are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, for 15 cents per copy.

* * *

An invitation to participate in National Training Laboratories' 1967 summer program—an opportunity to increase self-understanding, to improve your personal effectiveness and leadership in relationships with others: family, work groups, organizations, and communities—and to learn the new knowledge in human behavior, groups dynamics, and concepts for change in organizations and communities.

This is the twenty-first summer for NTL's Laboratories in Human Relations Training. This summer there will be three sessions in Bethel, Maine; one at the University of California Conference Center, Lake Arrowhead, California; one in Cedar City, Utah.

In addition to the basic human relations laboratories, there are several laboratories in specialized professional and occupational areas. For those who are involved in and concerned about human problems in education, there are the 7th Annual Laboratories for Educational Leaders and the 8th Annual Laboratories in Higher Education. And for volunteers and professionals interested in leadership training for community action programs, there are the 8th Annual Laboratories in Community Leadership Development.

For further information, write to National Education Association, National Training Laboratories, 1201 16th Street, Northwest, Washington, D.C. 20036.

* * *

A new smog-density monitoring system that combines a laser beam with a set of equations has been devised and successfully tested by a Northwestern University specialist in meteorological instruments.

Known as LIDAR, the system provides information about smog particle density and altitude much more rapidly and inexpensively than the conventional technique of taking air samples via helicopter.

Earl E. Barrett, associate professor of engineering sciences at Northwestern's Technological Institute, described LIDAR (for "light detecting and ranging") in a paper accepted for publication in the Journal of Applied Meteorology.

While several other research teams have developed laser-based pollution detectors, only Barrett has devised mathematical techniques for evaluating the information obtained. His equations are used to calculate the amount of solids per cubic foot of air indicated in LIDAR data.

Barrett, who has been developing his laser device since 1964, recently completed the third test on the roof of the Technological Institute in Evanston. LIDAR's vertical laser beam has probed layers of smog particles wafted in usually at about 200 to 550 feet in the air, though he used it one night to measure a smog concentration that topped out at over 4,000 feet.

LIDAR, also known as "optical radar," is an extension of microwave radar techniques to the shorter wave lengths of laser beams. Radar uses radio microwaves of about one centimeter (one third of an inch) in length. It is commonly used by meteorologists to detect storm clouds. Radar waves can bounce detectable signals off tiny moisture droplets down to about one-tenth of a centimeter.

Radar cannot detect air pollution particles, which are about one-tenth again as small as the water droplets in clouds. But LIDAR can.

LIDAR uses a laser ("light amplification by stimulated emission of radiation") beam of intense light from a single, pure color. The light has about a one micron wave length.

LIDAR won't tell what type of particles, chemically speaking, are in the air, but it will detect small solids or liquid droplets. Barrett says it could be used to detect a sulphuric acid mist, a common pollutant, though he has not used it for this purpose.

Smog particles arrive in the north suburban area of Chicago on an occasional southeast wind from Gary, Indiana, or southeast Chicago, says Barrett. If most North Shore residents do not realize there is sometimes a potential pall of smog (particles plus moisture) 100 or more feet above them, it is because the material is usually put into the air from smoke stacks 100 or 200 feet high.

Barrett's vertical profile readings of air pollution over the Technological Institute confirm speculation that the lowest layer of air in the Chicago area is usually cleaner than that several hundred feet up.

The Northwestern University meteorologist's work uses a ruby laser device first developed in the early 1960's. His work is being supported by a research grant from the U.S. Public Health Service, Bureau of State Services, Division of Air Pollution.

Barrett is a specialist in meteorological instrumentation, cloud physics, atmospheric chemistry and dynamic meteorology.

* * *

I/D/E/A, the action-oriented division of the Kettering Foundation, announced this week that applications for the I/D/E/A Summer Fellows Program for 1967 are now available.

Four hundred school administrators will be selected to participate in this year's Institutes which will be held at the Kamehameha Schools in Honolulu during the first, second, and third weeks in July. Travel expenses and room and board for the Institutes will be paid for by the Foundation.

The purposes of the I/D/E/A Fellows Program are: (*a*) to extend the scope of school administrators' knowledge about educational innovations; (*b*) to offer administrators an opportunity to assess the effectiveness of current innovations; (*c*) to suggest strategy which administrators can adopt to expedite change; (*d*) to fan the spark of inventiveness that is in each of us; (*e*) to create a national network of school administrators interested in inventive changes.

The Institutes are open to elementary and secondary school administrators in the public and private schools of the United States and its possessions.

Administrators interested in applying should write to I/D/E/A, P. O. Box 446, Melbourne, Florida 32901.

* * *

Applications are now being accepted for Fulbright-Hays appointments for university lecturing and advanced research abroad during 1968-69. It is expected that specialists in psychology will receive appointments in about a dozen countries. Under the Fulbright program, such specialists have this year been serving as lecturers in Australia, Belgium, Denmark, Ireland, Malaysia, the Netherlands, New Zealand, Norway, Thailand, and Uruguay; and they have in recent years held awards for research in Austria, India, Italy, New Zealand, Norway, and the United Kingdom.

The basic application requirements are U.S. citizenship; a doctoral degree or equivalent status for research; college or university teaching experience for lecturing appointments; in some cases, proficiency in a foreign language.

Senior Fulbright awards generally consist of a maintenance allowance in local currency to cover normal living costs of the grantee and family while in residence abroad, and round-trip travel for the grantee (transportation is not provided for dependents). For lecturers going to most non-European countries, the award includes a dollar supplement, subject to the availability of funds; or it carries a stipend in dollars and foreign currency, the amount depending on the assignment, the lecturer's qualifications, salary, and other factors.

For lecturing awards under the 1968-69 program, application before May 1, 1967 is strongly recommended. The deadline for research applications is June 1, 1967.

Application forms, a list of openings in psychology, and details on the terms of awards for particular countries are available from the Committee on International Exchange of Persons, 2101 Constitution Avenue, N. W., Washington, D.C. 20418.

* * *

The Association for the Study of Negro Life and History will hold its fifty-second annual meeting at the Voyager Inn, Greensboro, North Carolina, on October 12-15, 1967. The Agricultural and Technical College of North Carolina is the host institution. Those interested in proposing papers, or sessions, or other participation should contact the program chairman, Walter Fisher, Morgan State College, Coldspring Lane and Hillen Road, Baltimore, Maryland 21212.

* * *

The National Science Foundation has awarded Oberlin College four undergraduate research participation grants and one academic year extension grant. The grants total $34,860.

The URP grants will support the developing competence of over 25 promising undergraduates who plan to pursue careers in science. John G. Borkowski of the psychology department will direct funds of $17,500, supporting the research of five psychology majors during the 1967-68 academic year and of ten participants during the summer of 1968.

During the summer of 1967, Edward J. Kormondy of the biology department will direct the department's first summer URP grant, of $6,600, with at least six undergraduates; Robert E. Warner of the physics department, a URP grant of $4,200, three students; and James L. Powell of the geology department, one of $4,200, three students. Summer participants receive weekly stipends of $60 a week for about ten weeks each.

The academic year extension grant of $2,360, directed by Haven Whiteside of the physics department, will support a study of K mesons.

While most of the research projects will be done on the Oberlin campus, one student will work on field geology of the Beartooth Mountains in Montana; others will go to the NASA-Lewis Research Center in Cleveland, the Harvard Cyclotron Laboratory, and the Electron Accelerator in Cambridge, Mass. One or two biology students may work at a marine laboratory off-campus.

* * *

The Joint Commission on Correctional Manpower and Training of Washington, D.C., reported in a recent Newsletter that hard on the heels of the President's Congressional crime message and the National Crime Commission's trail-blazing report, members of Congress have begun introducing a flood of legislation dealing with all aspects of crime control, including corrections and training of personnel. Now that Congress has finally been aroused to the magnitude of the crime problem, the chances for passage of at least some legislation this year or next is considered excellent. One of the dangers is that in the haste to do something to please their constituents, Congressmen may approve inadequate or otherwise unsatisfactory legislation. This is particularly true in this field. The Commission will follow all pertinent legislation carefully, and will communicate with members directly or through its Newsletter as to its views and possible requests for action. Persons interested in a specific bill should write directly to the Congressman or Senator who has introduced it.

The President's Safe Streets and Crime Control Act of 1967 is before the Senate as S. 917, introduced by Sen. John McClellan (Ark.), and in the House as H.R. 5037 by Rep. Emanuel Celler (N.Y.). Hearings are already being held. Similar bills include H.R. 5250 by Rep. James Corman (Calif.), H.R. 5354 by Rep. Herbert Tenzer (N.Y.), and H.R. 5612 by Rep. Jacob Gilbert (N.Y.).

Establishment of a unified U.S. Corrections Service, introduced by Sen. McClellan as S. 916, is before the House as H.R. 5038 by Rep. Celler, and also H.R. 5613 by Rep. Gilbert, H.R. 5282 by Rep. Tenzer, H.R. 5251 by Rep. Corman, H.R. 6251 by Rep. Don Edwards (Calif.) and H.R. 6393 by Rep. Peter Rodino (N.J.).

The proposal for a Federal Judicial Center, in the Senate by Sen. McClellan as S. 915, is in the House as H.R. 5385 by Rep. Celler and also H.R. 6111 by Rep. Corman.

A bill of particular interest to the Commission is H.R. 188, introduced in the House by Rep. William Anderson (Tenn.), known as the Law Enforcement Education Act of 1967, and providing aid to students of higher education in law enforcement and corrections. It calls for student loans and fellowships to be administered by the Commissioner of Education, and had been referred to the Committee on Education and Labor. Because of its implications for the Commission's program, a memo enclosing Rep. Anderson's floor statement on the bill has been sent to many member organizations. A similar bill, H.R. 6018, was introduced by Rep. Peter Kyros (Me.).

Another bill claiming Commission attention is H.R. 6162, introduced by Rep. Carl Perkins (Ky.). Known as the "Juvenile Delinquency Training Act of 1967," it is a companion bill for the juvenile field to the adult coverage of the Safe Streets and Crime Control Act. It authorizes assistance for planning at state and local levels for prevention and rehabilitation services, and grants to conduct research and demonstrate techniques and practices. It also raises manpower and training issues currently in the Commission's area of operations. The bill was discussed in the President's message to Congress on "America's Children and Youth," presented last month. A similar bill was introduced in the Senate (S. 1248) by Sen. Thomas Dodd (Conn.) and five cosponsors.

* * *

Journal of Genetic Psychology

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JULY, 1967

(Manuscripts are printed in the order of final acceptance)

Personality characteristics of teachers and their perception of organizational climate 167
By James B. Kenney, William F. White, and Harold W. Gentry

Assessing qualitative differences between sets of data 175
By John R. Tisdale

Relationship of anxiety with pain threshold 181
By Anthony Bronzo, Jr. and Gerald Powers

Preliminary investigation of AFROTC cadet attrition 185
By Anthony F. Bronzo, Jr.

Developmental changes in serial learning of word lists 191
By W. E. Simpson

(OVER)

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Effects of placebo, Dexamyl, and Lucofen on moods, emotions, and motivations 199
By Jean S. Cameron, Priscilla G. Specht, and G. R. Wendt

The social intelligence of students 211
By John Bottrill

Peer acceptance and under- and over-achievement in school 215
By Robert R. Weatherford and John E. Horrocks

The influence of word familiarity in stereotyping a leader 221
By Roland L. Frye, Eugene Schmuckler, and Joel R. Butler

The relationship of mental ability to anagram solving 227
By Edward I. Gavurin

Two scales to measure achievement motivation 231
By C. G. Costello

Inhibitory training of dogs: Effects of age at training in Basenjis and Shetland sheepdogs 237
By J. P. Scott, Jane H. Shepard, and Jack Werboff

Japanese-American crime and delinquency 253
By Harry H. L. Kitano

The generality of simplicity-complexity of social perception in a high school population 265
By Bernard Pyron and Philip Lambert

The Scriptural Literalism Scale: A preliminary report 275
By James H. Hogge and S. Thomas Friedman

The openness and affect denial scales: A preliminary report 281
By James H. Hogge and S. Thomas Friedman

Attempted suicide and body image 287
By David Lester

Individual attitude toward risk and choice between prisoner's dilemma games 291
By Roger Sherman

Academic underachievement: A suggested theory 299
By Daniel Brower

Scales for measuring depression and anxiety 303
By C. G. Costello and Andrew L. Comrey

Cultural orientations and the use of common objects in Iraq 315
By Ihsan Al-Issa and Wayne Dennis

Effect of acute exposure to altitude on time estimation 321
By Richard L. Cahoon

Age differences and scoring differences in dichotic listening performance . . 325
By James Inglis and Carol L. Tansey

NEWS NOTES 333

Published as a separate and in *The Journal of Psychology*, 1967, **66**, 167-174.

PERSONALITY CHARACTERISTICS OF TEACHERS AND THEIR PERCEPTION OF ORGANIZATIONAL CLIMATE*

The University of Georgia

JAMES B. KENNEY, WILLIAM F. WHITE, AND HAROLD W. GENTRY

A. INTRODUCTION

In recent years social scientists have set forth a number of formulations designed to advance our understanding of school administration (5, 6). One of the most significant of these approaches was the contribution of Halpin and Croft (7), who devised an instrument for describing the organizational climate of elementary schools. In essence, the climate of a school was determined by the teachers' perception of eight dimensions of organizational activity. Four (Disengagement, Hindrance, Esprit, and Intimacy) referred to social interactions within the faculty group; the remaining four (Aloofness, Production Emphasis, Thrust, and Consideration) related to the leader's behavior. The patterning of the dimensions yielded six profiles of organizational climates, ranging on a continuum from open to closed. In sequence, the climates were open, autonomous, controlled, familiar, paternal, and closed.

As the identification of the organizational climate of the elementary school is dependent upon the faculty's perception of interaction within the organization, it would be expected that the values, needs, and expectations of the individual teacher and the particular characteristics of the organization would play a substantial part in influencing the impressions formed. Evidence was provided by Gentry and Kenney (4) when they reported that the organizational climate of the elementary schools in a predominately segregated, urban school system showed that Negro teachers were much more inclined to view the climate of their schools as closed than were their white counterparts. Hinson (11) and Brown (1) reported that principals tended to view their schools in a more favorable light than did the school faculty. The effects of school size on teacher perception of organizational climate were examined by Flagg (3). He concluded that as school size increases, the climate of the school tended to become increasingly closed. On the other hand, Heller (10) found that teacher perception of the organizational climate of schools was not affected by membership in informal groups within the larger organization.

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For purposes of this study, an attempt was made to determine if the personality characteristics of teachers influenced their perception of the organizational climate of the schools in which they were employed. To achieve this purpose, two questions were posed: (*a*) Is there a statistically significant difference on any of 16 primary personality factors between elementary school teachers who perceive an "open" organizational climate and teachers who perceive a "closed" organizational climate when they are employed in an elementary school having either an "open or closed" climate? (*b*) Is there a difference between teachers who perceive an "open" organizational climate and teachers who perceive a "closed" organizational climate on two, second-order factors of the Sixteen Personality Factor Questionnaire (16 PF): viz., anxiety and intraversion-extraversion?

B. METHOD

1. *Sample*

From an urban population of 1145 female elementary school teachers, two groups were identified. These were (*a*) 26 teachers (grades 1-6) who perceived the organizational climate of their school as "open" and who were teaching in a school classified as "open" by the faculty of that school, and (*b*) 35 teachers (grades 1-6) who perceived the organizational climate of their school as "closed" and who were teaching in a school classified as "closed" by the faculty of that school.

2. *Procedure*

The Organizational Climate Description Questionnaire, OCDQ (7) and the Sixteen Personality Factor Questionnaire, Form A (2) were administered to the elementary school teachers in the population at their respective schools during the 1965-1966 academic year. To insure anonymity of participants, no names were required on either of the data instruments. The data permitted identification of (*a*) an organizational climate designation for each school, (*b*) the type of organizational climate perceived by each teacher, and (*c*) a personality profile for each teacher.

As the study involved only teachers in schools with open and closed climates, schools having these climate designations were identified. In order to refine the climate designation further, all of these schools that had a climate similarity score of 46 or above on the OCDQ were discarded.[1] This process, in essence, left only those schools that had organizational climates perceived by their faculties as falling on the extremes of the climate continuum. These climates were defined as follows:

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[1] The climate similarity score indicates the type of climate present in a school. A low score indicates that the climate of a school is very similar to prototypic profiles developed by the originators of the OCDQ, who suggested a cut-off score of 45 in a letter to one of the authors.

> 1. *The open climate* describes an energetic, lively organization which is moving toward its goals, and which provides satisfaction for the group members' social needs. Leadership acts emerge easily and appropriately from both the group and the leader. The members are preoccupied disproportionately with neither task achievement nor social-needs satisfaction; satisfaction on both counts seems to be obtained easily and almost effortlessly. The main characteristic of this climate is the "authenticity" of the behavior that occurs among all members.
>
> 2. *The closed climate* is characterized by a high degree of apathy on the part of all members of the organization. The organization is not "moving"; esprit is low because the group members secure neither social needs satisfaction nor the satisfaction that comes from task achievement. The members' behavior can be construed as "inauthentic"; indeed, the organization seems to be stagnant (8, pp. 2-3).

The sample was completed by selecting those teachers in the open and closed schools who perceived a climate identical to that of the school in which they worked. Again, as with the schools, all teachers having climate similarity scores of 46 or more were discarded. Thus, the final sample contained teachers who were definite in their perception of the climate of their particular school.

C. RESULTS

The responses on the OCDQ by all of the 1145 teachers originally involved in the study were subject to factor analysis for the purpose of comparing the factor loadings at the subtest level with those of the sample in the original Halpin and Croft study (7). The unrotated factor matrix yielded three eigenvalues in excess of unity. A principal component factor analysis using a varimax rotation was employed. The proportion of total factor-variance accounted for was slightly greater than that reported by the originators of the OCDQ analyzing similar samples: i.e., of the magnitude .63 as opposed to .62. The three second-order factors (Social Needs, Esprit, and Social Control) varied slightly from the factor values reported by Halpin and Croft, with Esprit accounting for the greatest percentage of factor variance in both studies followed by a reversal of the position of Social Needs and Social Control.

In the second step of the analysis, the raw scores of the subjects in the open and closed groups were subject to a test of the Standard Error of Difference on each of the 16 first-order personality measures.

When comparisons were made on each of the 16 personality factors, a difference significant at the .001 level was found on Factor E (Dominance or Ascendance *vs*. Submission) with the "open" group being the more submissive, while a difference significant at the .05 level was identified between the two groups on Factor Q_3 (High Self-Sentiment Formation *vs*. Poor Self-Sentiment Formation) with the "open" group evidencing more self-sentiment than did the "closed" group. A third significant difference was found to exist between the two groups on Factor Q_4 (High Ergic Tension *vs*. Low Ergic Tension) with the "closed" group being higher on ergic tension than were the *S*s in the "open" group.

The third step consisted of subjecting the 16 first-order personality factors of the teachers in the open and closed groups to a principal component solution and an orthogonal rotation of the factor matrix for the purpose of identifying the higher-order factor structure. The cumulative proportion of variance accounted for by the principal components and respective weights of the 16 personality factors were reflected in the rotated matrix.

Eber[2] identifies the specification equation for the second-order anxiety factor as being comprised of a constant plus the primary Factors C, H, L, O, Q_3, and Q_4, and for the second-order factor of Intraversion-Extraversion as being composed of a constant plus Factors A, E, F, H, and Q_2. As may be seen from the rotated factor matrixes (see Table 1), in the open climate perception, all six factors are accounted for and reflect moderately high weights. The Intraversion-Extraversion factor accounts for four of the five factors, again with proportionately high weights with only the H factor being omitted as it was felt that its weight of .26784 was not sufficiently high to warrant inclusion. In the open perception of the organization it should be noted that the two second-order factors account for .4728 per cent of the common factor variance.

The closed perception of the organizational climate shows that the two second-order factors reverse their position from that identified in the open situation, with Intraversion-Extraversion becoming the greatest contributor in terms of the percentage of common factor variance. In this factoring, all five of the personality factors which comprise the second order factor of Intraversion-Extraversion are present with their weights being, generally, quite high. The anxiety factor as reflected in the closed climate situation identifies five of the six personality factors as sufficiently high for inclusion. The two second-order factors in the closed situation account for .5208 of the common factor variance.

For purposes of this paper, only the two principal second-order factors are presented and discussed. For purposes of clarity, however, it should be noted

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[2] Personal communication, Atlanta, Georgia, 1966.

TABLE 1
PRINCIPAL SECOND-ORDER FACTORS ON 16 PF DATA

	Climate perceived as open		Climate perceived as closed	
Variable	Anxiety	Intraversion-Extraversion	Intraversion-Extraversion	Anxiety
A	— .24511	.65841	.81247	.11353
B	.53935	— .01861	— .03438	— .06215
C	.47243	— .00750	.24435	.86640
E	— .18203	.65841	.54992	.06672
F	.22283	.84098	.84016	— .19950
G	.20508	— .26893	— .51060	.45679
H	.37316	.26784	.58819	.24230
I	— .21859	— .15646	.23093	— .18851
L	— .64585	.18281	.08603	— .45649
M	— .02288	.00686	.01867	— .06145
N	.22883	— .17554	— .30837	.39825
O	— .86505	.12408	.00165	— .87235
Q_1	.08461	.10357	.01233	.04960
Q_2	.11103	— .78971	— .82480	— .17596
Q_3	.68843	— .00135	— .45483	.56845
Q_4	— .88030	— .04891	.00633	— .65598
Factor weights	3.3727	2.4596	3.3795	3.0332
% common factor variance	.2734	.1994[a]	.2744	.2464[b]

[a] $\Sigma = .4728$.
[b] $\Sigma = .5208$.

that six eigenvalues greater than unity were obtained in each treatment from the correlation coefficients. It should be noted that in the "open" treatment, 77 per cent of the cumulative proportion of total variance was accounted for by these six second-order factors and that in the "closed" treatment 76 per cent of the cumulative proportion of total variance was accounted for by the six second-order factors identified in this factor analytic treatment.

Finally, to assess the degree of factor similarity between factor structures under "open" and "closed" treatments, a test of congruence (9) was computed for the two sets of second-order factors. The relationships between factors are as shown in Table 2.

D. DISCUSSION

There appear to be three major implications in the analyses and results of this study. The Halpin-Croft OCDQ seems to be a competent and reliable instrument for measuring psychosocial variables in educational structures. Since the results from analyzing a single large urban population were almost

TABLE 2
CONGRUENCE OF THE TWO SECOND-ORDER FACTORS WHEN THE TWO SAMPLES WERE FACTORED INDEPENDENTLY

Second-order factors	Anxiety (open climate, rotated factor matrix)	Intraversion-Extraversion (open climate, rotated factor matrix)
Anxiety (closed climate, rotated factor matrix)	+.77	—.06
Intraversion-Extraversion (closed climate, rotated factor matrix)	—.15	+.95

identical to these derived from a highly heterogeneous sample drawn from several states (7), much confidence is established in using the OCDQ for identifying the organizational climate of a public elementary school. The OCDQ is a major step in the current intensive search to find an instrument capable of identifying organizational characteristics of a particular school or school system, and allowing for comparisons of climate differences among schools along the major dimensions of Social Needs, Esprit, and Social Control.

The second major conclusion points to the personality differences of teachers who perceived the climate of their school as "open" or "closed." It was found that those teachers, who perceived the climate of the school as "open" and were, themselves, working in a school that was rated as "open," were comparatively kind-hearted, mild, and maintained high self-sentiment formation, with little ergic tension. The personality behavior of these teachers in the "open" climate appeared to be nonthreatened and very controlled, showing little need to dominate or be hard, stern, and assertive. This is about what anyone would expect from "open"-minded teachers who were working in an energetic, lively school which was moving toward the social needs of the teachers and students.

On the other hand, teachers who rated their schools as "closed," and who were, themselves, apathetic toward the school's organizational situation, were inclined to be markedly more dominant and stern than teachers who rated their schools as open, showing very low self-sentiment formation with a relatively high degree of ergic tension. There are definitely two different personality types described in the "open" and "closed" groups. Although correlations do not express causality, it seems to be a worthwhile objective for future research to investigate the possibility that those teachers who perceive the "closed" climate actually stifle and make stagnant the educational spirit of the school, while the "open" type of perceiver is more determining of the social needs of the group and provides the leadership for an ongoing, vital school program and spirit.

A third major finding in this study was the clearly definable and significant difference of both groups of teachers along other major dimensions of personality behavior. Six factors emerged from a higher-order factoring of the original, first-order personality traits from data obtained on the 16 PF. For both groups, two of these factors, anxiety and intraversion-extraversion, contributed about 50 per cent to the common factor variance and are the main foci of the present discussion.

In "open" organizational climates, general anxiety seemed to contribute significantly more to the behavioral responses of the teachers than did either intraversion or extraversion. The anxiety that is described in the second-order factor structure should not be conceived as necessarily being detrimental and indicative of poor mental hygiene. Anxiety belongs in learning situations and can foster achievement, competition, and a strong drive to promote the common good of society. The "open" teachers, then, seemed to be a group that worked hard toward common and personal goals. In brief, the group could be described as energetic, ambitious, and involved in school activities. The "closed" teacher members were more inclined than "open" teachers to be characterized by an outgoing, demonstrable type of response or by being withdrawn and isolated in their teacher roles. The "closed" group would be the more schizothymic, displaying a defensive, deferring behavior. Perhaps they could be described as "generating a lot of activity," but more from personal gain than the common good of the school. The reversal of the factor structure of the personality variables of the two groups is another index of the differential of the "closed" and "open" teachers. Although the anxiety and intraversion-extraversion factors were identifiable among all the teachers in both groups, there were discriminable qualities to these factors.

E. SUMMARY

From an urban population of 1145 elementary school teachers, personality behavior of teachers who perceived their schools to be "closed" was compared with the characteristics of teachers who rated their schools as "open" climates. Two second-order factors of anxiety and intraversion-extraversion contributed more than 50 per cent to the common factor variance of each group, but a reversal of the factor structure of the two groups provided indices of the differences between teachers in "open" and "closed" climates.

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ASSESSING QUALITATIVE DIFFERENCES BETWEEN SETS OF DATA*

Union College Character Research Project, Schenectady, New York

JOHN R. TISDALE

A. INTRODUCTION

Some years ago a research method called "characteristic differences" was described briefly in connection with its demonstration at a research section meeting of a national religious group (4). Since then, it has been used in at least one major research effort (3), and has been developed to a point at which an additional description and evaluation seem both possible and desirable. Such is the purpose of this paper.

Basically, the approach makes use of a consensus of individual judgments concerning two (or more) sets of data. It is thus related, though distantly, to the use of judgments in clinical diagnosis, psychophysics, and attitude scaling [cf. (2, p. 172) and (5)]. One of its chief differences, however, lies in its appropriateness for constructed-response or open-ended data.

Usually a group of judges are given two sets of data which they are asked to examine for any differences between the two sets that they might observe. Only those differences are accepted that are agreed upon by some specified fraction of the judging group. The data might consist of such things as self-descriptive statements from two different subjects, critical incidents reported by observers of some process under study, responses to different forms of a test or examination, or the like.

B. STRENGTHS

The strengths of this method lie in its simplicity, its flexibility and potentially diverse applicability, and its appropriateness for dealing with qualitative differences among samples. It requires no data-processing equipment nor elaborate instructions. The basic data on which it is carried out need not be ordered, but separated only in terms of some single criterion which may be external to the data. The educational level and technical competence of the judges need not necessarily be high, depending on the complexity of the discriminations that the experimenter might wish to have made. In fact, one

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study has indicated that general professional training does not increase the accuracy of some clinical estimates at all (1).

It is this simplicity itself that makes this method such a flexible tool with a wide variety of possible applications. A sociologist might use it in preliminary studies of differences in leadership expectations between various types of work groups. An anthropologist might search for tentative value differences between two different cultural groups. A clinician might examine Rorschach protocols produced by subjects with differing diagnoses. A salesman might even attempt to improve his sales techniques by listing all characteristics of both his successful and unsuccessful interviews and then by checking the lists for possible differences.

The search for characteristic differences might also prove helpful as a partial check on the validity of some separation criterion itself. Assume, for instance, that one wishes to develop a rationally constructed test of some personality trait, such as anxiety. After making up a pool of items that, in the test author's judgment, would seem to indicate the presence or absence of this trait, one administers the test to a group of subjects presumed to vary on the trait in question. An item analysis might then be taken to discover items discriminating between high and low quartiles. The items characteristically endorsed by the high scorers are then compared with those endorsed by the low scorers. The differences reported by the judges between the groups should reflect substantially the same differences that the author initially set out to measure. This can provide a helpful early step in the construct validation of a personality test.

Too, this basic method can be used to arrive at a consensus concerning similarities between groups as well as differences, often concurrently. It may be used with three or four groups instead of two, although such use may involve complication. Use with more than three or four groups, however, becomes impractical.

In all of these instances, this approach was used with data that could not easily be quantified or for which quantification would be undesirable. In many instances, particularly in exploratory stages of research in an area, strictly quantitative methods may overlook valuable insights or even be quite inappropriate. In a study of a pilot project designed to teach scientific decision-making skills to a college sample, for instance, no significant differences could be found between participants and nonparticipants on nearly all of the quantitative measures used. The characteristic differences procedure, however, indicated some specific qualitative differences which opened up a new area for further investigation (7).

As described here, then, this approach is best suited for exploratory research with open-ended data designed to generate promising leads to be followed up more closely later. It is not *per se* a method of hypothesis testing. Thus, the results one finds with it must always be accepted tentatively, subject to further verification by more precise techniques.

C. LIMITATIONS

As with any research device, of course, there are certain limitations that should be observed. In describing areas of usefulness above, potential areas of misapplication have been suggested. Another caution has to do with the background of the judges used. When it was stated that the method did not necessarily require highly trained judges for its use, it was not meant to imply that the judges' training and skill were irrelevant to the results. As in any approach that involves the use of judgments or ratings, the results are dependent to some degree, certainly, upon the judges' abilities. For the use of the characteristic-differences method, the nature of the data and the level of discrimination potentially sought will tend to dictate the necessary technical competence demanded of the judges. It would (presumably, at least) be inappropriate to use college sophomores in looking for differences between Thematic Apperception Test (TAT) protocols, where the possibility of rather subtle distinctions might exist. On the other hand, if one is interested only in large and very obvious differences, the judges' level of training and ability may be much less important. The decision as to what kind of judges to use with any given sets of data must ultimately lie with the experimenter himself.

A basic implied assumption is that the reliability of the method is best measured by interjudge agreement. This is defensible, since from a hardheaded operational point of view, one cannot meaningfully speak of differences being "there" that someone does not judge to be there; and consensual validation ultimately is the usual scientific basis for deciding on what is "really" there.

On the other hand, the desire to obtain agreement should not blind one to certain values inherent in the fact of divergent reports of differences. Variety of judgments may produce lack of agreement, but they also produce a variety of hypotheses for possible future testing. Thus, the divergent perceptions produced by a minority of the judges in an exploratory research situation may in the long run prove more fruitful than the things upon which all or most of the judges can agree.

Fortunately, a validation technique exists that may be used to check *both* divergent and agreed-upon differences. Using a "sortback" approach, one can validate the observed characteristic difference in a way similar to cross-validation of psychological test construction. The items (in this instance) from the two groups of data are put into a common pool and given to a new set of judges with instructions to sort the items into two groups according to the characteristic difference being tested. If the new judges are able to place the items accurately into the two original classes, the reported difference may be accepted.

Another potential problem may lie in the tendency of judges to be overzealous in searching for differences. The fact that they have been given material to judge may well imply to them that the experimenter expects differences to be found and will be disappointed if they are not. If the data allow it, one can check on this possibility by asking judges to examine at least two different paired sets of data, one of which (a control) consists of material drawn from a single homogeneous parent population and randomly assigned to two groups (6).

In examining the kinds of differences that judges report, one should note too whether certain individual items in the data seem to be influencing judgments unnecessarily. It is possible, certainly, for one negative statement in a group of neutral ones to lead one to characterize the whole group as negative in tone [cf. (8) for a roughly analogous situation]. Here a set of instructions that are explicit about the degree of halo effect regarded as desirable can be helpful. Nevertheless, the precise influence here of the nature and homogeneity of the data upon the type of differences observed has not yet been investigated.

It is, finally, absolutely necessary to observe stringent safeguards concerning contamination of judgments from the judges' knowledge of the makeup of the groups. No judge should know the nature of the source of the data, nor, in general, should there be any indication in advance of whether the experimenter is looking for or expecting particular types of differences. If necessary, some editing of the data may have to be done in order to obscure sex or educational differences between the groups where such knowledge might unnecessarily influence the differences found. Placing the data uniformly typed on plain pages with only enough description to make it comprehensible would seem best.

D. Summary

The method of characteristic differences, then, is an extremely promising technique for assessing qualitative differences between different sets of data. It is both simple to use and flexible in application. At the same time, factors such as the judges' level of training, appropriate levels of interjudge agree-

ment, influence of particular items within the data sets, and potential values in noting divergent judgments must be considered in its use. With an idea of both its strengths and limitations, one may find it to be a very helpful basic tool in the researcher's limited armamentarium for dealing with qualitative differences among data.

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RELATIONSHIP OF ANXIETY WITH PAIN THRESHOLD*[1]

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A. PURPOSE

The relationship between pain and anxiety is not clearly understood (1, 6, 8). Within the past few years, according to Nemoff (9), experimenters have shifted from the psychophysical approach to one relating pain sensitivity to personality factors. These studies are open to many interpretations because of the "clinical method" of personality measurement along with the lack of statistical treatment of the data.

Since fear and anticipation seem to increase perception of pain (4, 9, 10), and because anxiety is also a sympathetic autonomic response, it is hypothesized that pain threshold will be lowered in an anxiety provoking situation.[2]

B. METHOD

1. *Subject*

S was a randomly chosen 20-year-old female college sophomore from a liberal arts college in New England. One S was used because of limited access to the apparatus and because other investigators have indicated that valuable information may be gained from $N = 1$ studies (5, 7).

2. *Apparatus*

A modified version of the Hardy, Wolff, and Goodell (3) dolorimeter was used as source of the pain stimulus. A separate switch allowed S to terminate heat stimulus when pain was perceived. An electrical timer recorded pain threshold in hundredths of a second.

3. *Procedure*

Experimental design consisted of three situations:

a. Control. S came into room, was daubed with India ink on forehead, and blood pressure and pulse were recorded. S was instructed to shut off the pain

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[1] The idea from this study was taken from an unpublished study by George Allen, Anthony Bronzo, and John Winze at the Graduate School of Boston College.

[2] Anxiety was operationally defined as an increase in blood pressure and pulse over the initial measurements of these variables.

stimulus only when pain was perceived. Ten trials with a three-minute interval between trials were conducted.

b. Nonanxious. Same as *a.*, except *S* was told that she had done very well so far and that *E* had been using too much voltage in the machine. Voltage would now be cut in half.

c. Anxious. Same as *a.*, except *S* was told that the machine was getting too hot and voltage could not be controlled, but that it was essential that she finish the experiment. *S* was instructed again not to pull away from the stimulus until pain was perceived.

Pulse and blood pressure were taken between each trial in *a.*, *b.*, and *c.*; when one situation had been completed *S* was taken out of the room until pulse and blood pressure fell back to the initial measurement. Despite the instructions in *b.* and *c.*, the voltage was maintained at a constant 90 volts in all situations. Two replications with counterbalancing were also recorded. All measurements were then averaged.

C. Discussion

Table 1 shows that significant differences do occur between the three experimental conditions in support of the hypothesis. The nonparametric McNemar Sign Test was used to analyze the data, as this statistic makes fewer assumptions about the population under investigation. This test measures the directionality and not the amount of difference between observations.

TABLE 1
PAIN THRESHOLD SIGNIFICANCE LEVEL AND THE AVERAGE PULSE RATE, BLOOD PRESSURE FOR TESTING SITUATIONS: *a.* CONTROL, *b.* NONANXIOUS, AND *c.* ANXIOUS

Situation	Pulse	Blood pressure	Threshold	Significance
a. Control	85	121/81	1.22	
			a.-b.	.05*
b. Nonanxious	84	119/80	1.30	
			a.-c.	.05*
c. Anxious	91	129/92	1.00	
			b.-c.	.01**

* This is for a one-tail hypothesis.
** This is for a one-tail hypothesis.

The most significant change was between the *b.* and *c.* situations. This is in support of the one-tail hypothesis, as the "anxious" trials indicated a decrease in pain threshold. A problem arises here: in the *c.* situation *S* might have perceived this part of the experiment as harmful and consequently pulled away from the stimulus *before* pain threshold was reached.

According to Edwards (2), investigators have emphasized a distinction between pain as perceived and the behavior that may or may not result from the perception. Nemoff (9) reported, after studying 20 female *S*s, a greater fluctuation in pain response rather than in pain perception; pain perception was found to be a relatively stable factor.

The difference between the *b.* and *c.* situations can be looked at in three ways: (*a*) pain response rather than pain threshold was being measured, (*b*) pain threshold was being measured, or (*c*) an interaction of the two. On the basis of testimony from the *S* after the experiment, it is felt that pain perception is the variable being measured.

The present study would have been better controlled if galvanic skin response (GSR) equipment had been available. *E* would have been better able to evaluate the *S*'s statement that pain had been the only criterion for ending the trials, as here pain response would have been recorded separately from that of threshold (3, 9).

D. SUMMARY

An $N = 1$ study was designed to test the relationship of anxiety on pain threshold. The hypothesis that pain threshold would be lowered in an anxiety producing situation, as measured by an increase in pulse and blood pressure, was supported ($p < .01$) by the McNemar Sign Test statistic.

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PRELIMINARY INVESTIGATION OF AFROTC CADET ATTRITION*[1]

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A. PURPOSE

The Reserve Officers Training Corps (ROTC) is one of the largest sources for potential officers that the services can draw upon. The need for reducing attrition during ROTC training has become of great importance within the past few years because of the increased need for professional military personnel. Research in this area has been primarily concerned with attitude and personality inventories (1, 6, 7, 8, 10, 12, 13, 14).

The results of these studies have enabled officials to understand better those factors involved in joining and remaining in ROTC. However, no study has demonstrated outstanding success in prediction of attrition, but the savings in manpower and money that could be achieved by better than chance predictors make this a valuable area of investigation for the military.

The purpose of this study is to determine if personality traits differ between Air Force Reserve Officers Training Corps (AFROTC) cadets and AFROTC cadet dropouts; if significant differences are found, future investigators could use the present data to derive prediction coefficients for the discrimination of those cadets that will, and will not, remain in the AFROTC. On the basis of the stereotyped concept of military personnel (11), it is hypothesized that AFROTC cadets will value more highly than will AFROTC dropouts the following traits: Bureaucratic Tendency, Conformity, Leadership, Achievement, Decisiveness, and Goal Orientation, while the cadet dropout will value more highly than will cadets the traits of Independence, Support, Recognition, Benevolence, Practical Mindedness, Variety, and Orderliness.

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[1] This study was submitted in partial fulfillment of the requirements for the Master of Arts degree in the graduate school at Boston College.

[2] The author would like to extend his appreciation to Dr. Daniel J. Baer, without whom it would have been impossible to complete the investigation.

B. Method

1. *Subjects*

One hundred eighty-three male *S*s were chosen from the sophomore, junior, and senior classes of an urban, Catholic, liberal arts college in New England. According to their present ROTC status, *S*s were classified into two groups: 94 AFROTC cadets and 89 AFROTC cadet dropouts. A dropout was defined as a cadet that had voluntarily left the AFROTC program; medical dropouts and college dropouts were not considered for the study.

2. *Test Instruments*

A test battery consisting of the DC-B scale (a measure of bureaucratic orientation),[3] the Survey of Interpersonal Values (2), and the Survey of Personal Values (3) was used.

According to Gordon (2), the SIV measures six personality traits: (*a*) Support—being treated with understanding, receiving encouragement from other people, being treated with kindness and consideration; (*b*) Conformity—doing what is socially correct, following regulations closely, doing what is accepted and proper, being a conformist; (*c*) Recognition—being looked up to and admired, being considered important, attracting favorable notice, achieving recognition; (*d*) Independence—having the right to do whatever one wants to do, being free to make one's own decisions, being able to do things in one's own way; (*e*) Benevolence—doing things for other people, sharing with others, helping the unfortunate, being generous; and (*f*) Leadership—being in charge of other people, having authority over others, being in a position of leadership or power.

According to Gordon (3), the SPV measures six personality traits: (*a*) Practical Mindedness—to always get one's money's worth, to take good care of one's property, to get full use out of one's possessions, to do things that will pay off, to be very careful with one's money; (*b*) Achievement—to work on difficult problems, to have a challenging job to tackle, to strive to accomplish something significant, to set the highest standards of accomplishment for one's self, to do an outstanding job in anything one tries; (*c*) Variety—to do things that are new and different, to have a variety of experiences, to be able to travel a great deal, to go to strange or unusual places, to experience an element of danger; (*d*) Decisiveness—to have strong and firm convictions, to make decisions quickly, to always come directly to the point, to make one's position on matters very clear, to come to a decision and stick to it; (*e*) Orderliness—to have well organized work habits, to keep things in their proper place, to be a very orderly person, to follow a systematic approach in doing things, to do things according to a schedule; and (*f*) Goal Orientation—to have a definite goal toward which to work, to stick to a problem until it is solved, to direct one's efforts toward clearcut objectives, to know precisely where one is headed, to keep one's goals clearly in mind.

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[3] An unpublished preliminary manual by L. V. Gordon.

The DC-B, SIV, and SPV were chosen because of their development and use on other military and college populations.

3. *Procedure*

The 94 cadets were tested in a one-hour session. The dropouts were tested in small groups over a two-week period because of their complete disassociation with the AFROTC program. The order of test administration was randomized for each *S* in both groups.

C. DISCUSSION

*S*s' scores were punched on IBM cards and the data were processed on an IBM 1620 computer. Means, *SD*s, and *t* tests of mean differences between the cadet and cadet dropout groups are presented in Table 1. *t* tests between the groups indicate support for the one-tail hypothesis on the following scales: Bureaucratic Tendency, Independence, Leadership, and Variety.

TABLE 1

MEANS, *SD*s AND *t* TESTS OF DIFFERENCES BETWEEN MEANS FOR THE DC-B, SPV, AND SIV SCALES

Test	Scale	Cadet group Mean	Cadet group *SD*	Dropout group Mean	Dropout group *SD*	*t*
DC-B	Bureaucratic Tendency	77.0	16.8	67.9	17.8	—3.51***
SIV	Support	13.4	4.3	14.0	3.2	1.10
	Conformity	15.1	4.1	14 5	3.6	—0.94
	Recognition	12.0	5.3	12.4	3.9	0.60
	Independence	14.9	5.3	17.9	4.4	4.03***
	Benevolence	16.2	5.3	16.4	4.2	0.33
	Leadership	18.2	5.5	14.6	4.2	—4.88***
SPV	Practical Mindedness	9.7	4.5	10.8	4.8	1.51
	Achievement	19.3	5.7	18.1	5.6	—1.47
	Variety	11.2	7.7	13.9	7.6	2.39**
	Decisiveness	17.3	5.0	16.2	4.9	—0.15
	Orderliness	13.6	6.1	13.5	6.1	—0.07
	Goal Orientation	18.6	6.1	17.1	6.2	—1.65

** $p > .01$ for a one-tail hypothesis.
*** $p > .001$ for a one-tail hypothesis.

It would seem that cadets would more highly value Bureaucratic Tendency than would dropouts because of the integrated network of bureaucracy and red tape that make up the military structure. To remain in such a system, for an extended period of time, necessitates some acceptance of the structure. When the same reasoning is applied, it follows that Independence would be more highly valued by the dropouts because the military is a bureaucratic system made up of thousands of rules, standard operating procedures, and policies. Independence, as defined by Gordon (2), would seem to be anathema to a military career in such a bureaucratic system where orders and assignments must be complied with.

One of the main objectives of AFROTC is to develop military leaders. This object is stressed in class lectures, assignments, and on the drill field in a period of activity appropriately designated Leadership Training Laboratory. With this pervasive emphasis on Leadership, it is probable that the cadets would more highly value this trait than would the dropouts, because for the cadets to remain in the program means at least a partial acceptance of the stress placed upon Leadership.

Variety, as a personality trait, is correlated with the tendency of nonperseverance (3). The cadets exhibited perseverance by remaining in the AFROTC program, while the dropouts showed nonperseverance by leaving the program. Also, the lure of adventure and travel that is associated with Variety is not strongly emphasized in the AFROTC program. Professionalism, rather than the adventuresome life, is stressed.

The war situation in Viet-Nam could also be an influence on the low value placed on Variety by the cadets. Viet-Nam is certainly an area of adventure, travel, and new experiences. A sampling of cadets indicated that they would rather be assigned to stateside bases because of the increased chance of professional training and also because of the exclusion of dependents in many overseas areas.

Differences do not occur between the groups on Support, Conformity, Recognition, Benevolence, Practical Mindedness, Achievement, Decisiveness, and Orderliness. An examination of the definitions of these scales points out first that, with the exception of Conformity, the scales have little particular association with being either a cadet or a cadet dropout. Secondly, the homogenous nature of a college student body would not tend to differentiate between the two groups on those scales not related to the experimental design under investigation: namely, cadet *vs.* cadet-dropout values.

Although it would seem that Conformity is connected with the military system, this is not necessarily true. Krech, Crutchfield, and Ballachey (9) propose:

> That high degrees of uniformity in social beliefs, values, and practices may exist is not alone a sufficient criterion of conformity. . . . Nor can demonstrations of sheer conventionality be simply equated with conformity. Conventional ways of acting represent established solutions to problems; conventions are well oiled grooves of social conduct which are provided ready-made and often followed with minimal conflict. . . . (9, pp. 505-506).

The uniformity and conventionality of military life are then not as indicative of conformity as has been hypothesized; this could account for the insignificant difference on Conformity between the groups.

The hypothesis that personality traits differ between cadet and cadet dropouts has been supported ($p < .001$) by the present data. What does this mean for the military? If other investigations support the present results, future experimenters should be able to use stepwise linear regression statistics to derive coefficients for prediction of cadet attrition. These coefficients, if found to be accurate under cross-validation, will allow the military to appraise with more efficiency than in its present method of appraisal its ROTC admission policies and to reject the potential dropout before unnecessary time and money have been expended.

D. Summary and Conclusions

To determine if personality traits differ between AFROTC cadets and AFROTC dropouts, the Survey of Bureaucratic Tendency, Survey of Interpersonal Values, and Survey of Personal Values were administered to 94 AFROTC cadets and 89 AFROTC cadet dropouts. It was hypothesized that AFROTC cadets would value more highly than would AFROTC cadet dropouts the following traits: Bureaucratic Tendency, Conformity, Leadership, Achievement, Decisiveness, and Goal Orientation, while the cadet dropout would more highly value than would the cadet the traits of Independence, Support, Recognition, Benevolence, Practical Mindedness, Variety, and Orderliness. *t* tests of mean differences supported the hypothesis on Bureaucratic Tendency ($p < .001$), Independence ($p < .001$), Leadership ($p < .001$), and Variety ($p < .01$).

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DEVELOPMENTAL CHANGES IN SERIAL LEARNING OF WORD LISTS*[1]

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A. INTRODUCTION

Although evidence exists (1) that children verbalize very early according to adult grammatical rules, presumably the full development of grammatical skill requires many years of experience. This seems demanded by the complexity of the grammatical rules involved.

Recent investigations of serial verbal learning and recall (3, 7, 8, 9) have reflected the effects of language habits upon the relative ease of learning words in the various positions of a serial list and upon the relative ease of learning representatives of different grammatical classes. Specifically, for lists of high approximation to sentence word-order, a less-bowed serial position distribution of correct responses was obtained: that is, there was little difference in the ease of learning words in the various serial positions. This was in contrast with the learning of lists of lower approximation to sentence word-order, in which a more sharply bowed serial position distribution was obtained and words at the extremes of the list were most easily learned. With respect to the grammatical-class variable, it was shown that nouns, adjectives, and function words were more easily learned than were verbs or adverbs under conditions of grammatical word-order. For lists of low approximation to sentence word-order, less differentiation in the ease of learning these grammatical classes was observed.

On the basis of these results, it would seem that the long-term development of grammatical skill should be reflected in differential effects upon (*a*) the relative ease of learning lists of various approximations to sentence word-order, (*b*) the relative ease of learning different serial positions in lists varying in approximation to sentence word-order, and (*c*) the relative ease of learning representatives of various grammatical classes. The present investigation predicted that with increasing age (and, therefore, language skill) there should be an increase in the tendency toward differentiation of grammatical classes and approximation levels and the tendency for the serial position effect to interact with the approximation-level variable.

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One problem confronted in studying the effects of language habits on learning involves the need to use material that actually represents the language habits of the *S*s (2). This problem was handled by sampling the language of the age groups investigated and using these samples as learning material.

B. METHOD

1. *Experiment I*

In order to assure a basis of comparison of the present results with previous work using different techniques for generating verbal material (8, 9), the investigator conducted Experiment I with *S*s of the same high degree of language skill—college students.

Albion College students were asked to write 15-word sentences on any topic with the only restrictions being that at least one representative of each of the five grammatical classes (noun, adjective, verb, adverb, function word) be present and that no word be repeated in a given sentence. Six sentences were selected from this population in such a way as to maximize the size of the word sample used and to equate occurrence of grammatical-class representatives over serial position. These sentences represent Condition H, the highest approximation to sentence word-order.[2]

Medium approximation lists (Condition M) were constructed by breaking a Condition H list into five groups, the length of the groups varying between two and five words and corresponding roughly to phrases. The order of groups within a list was determined by a randomized 5 × 5 Latin square and was different for each *S* learning a given Condition M list. This procedure was followed in order to eliminate any systematic location of the "within-group" serial position effect noted earlier (8).

Low approximation (Condition L) lists were constructed by ordering the words according to rows of a randomized 15 × 15 Latin square. Each *S* learned a different order of words.

These lists were then used (with different *S*s) as material for learning by the method of serial anticipation. Stimuli were presented one at a time at a two-second rate by an externally timed Kodak Carousel slide projector. The *S* was instructed to anticipate as many words correctly as possible, and to guess when uncertain. There was a 10-second rest interval between trials. A green slide at the end of the rest interval indicated the beginning of the list. When S had correctly anticipated all of the words on one trial, the session was terminated.

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[2] Verbal material may be obtained from the author.

The Ss were 54 introductory psychology student volunteers at Albion College, who received course credit for participating. The Ss were randomly assigned to the experimental conditions with the restriction that each of the six lists under each of the three conditions was learned by three Ss. Prior to learning the word list, S practiced a list of four two-digit numbers.

2. *Experiment II*

Experiment II differed from Experiment I only in the verbal material used and the age of the Ss. Condition H lists consisted of six 15-word sentences sampled from compositions written as classroom assignments by fourth, seventh, and tenth graders.[3] Each sentence selected contained at least one representative of each of the five grammatical classes of interest, no word repetitions, and provided maximal size of word sample and equivalent distribution of grammatical classes over serial position. Condition M and Condition L lists were constructed in the manner of Experiment I. Procedural details were also identical to Experiment I.

The Ss were 54 pupils from each grade: fourth, seventh, and tenth. Three additional fourth and two seventh graders were dropped from the experiment for failure to reach the learning criterion within available time.

C. RESULTS

1. *Experiment I*

The mean numbers of trials to the learning criterion for Conditions H, M, and L were 3.6, 8.4, and 18.0 respectively. Analysis of variance ($F = 21.19$; $df = 2, 51$) and a Duncan Range Test indicated that each of the conditions differed from the others. For all statistical tests, $p < .01$ was used as the criterion for significance. Thus, ease of serial anticipation learning of a 15-word list increases with increasing approximation of the list to sentence word-order; and the present method appears successful in producing lists that are actually high, medium, and low in sentence approximation.

In examining the influence of grammatical class, no differences appeared among the mean correct responses for the five classes: noun (6.7), adjective (6.2), function word (6.2), verb (6.2), adverb (6.1). Analysis of variance F-ratios for Grammatical Class and its interaction with Approximation Level were less than 1. Grammatical Class did not affect learning.

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[3] Appreciation is expressed to the administrators and teachers of Harrington, North, and Washington Gardner High schools, Albion, Michigan, for their cooperative assistance. Dr. James Grisell, Lafayette Clinic, provided computer facilities for Experiment II.

The serial position distributions of mean per cent correct responses are shown in Figure 1. It is evident that the bow in the curve increases as approximation level decreases. This was objectified by the significant Serial Position by Approximation Level interaction ($F = 4.79$; $df = 28, 767$).

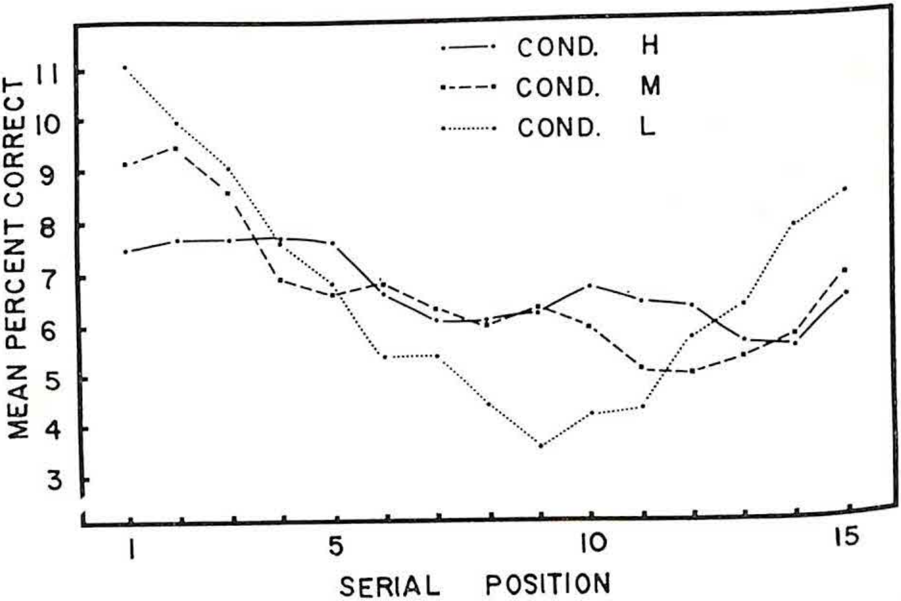

FIGURE 1
MEAN PER CENT CORRECT RESPONSES AT EACH SERIAL POSITION FOR HIGH (H), MEDIUM (M), AND LOW (L) APPROXIMATIONS TO SENTENCE WORD-ORDER; EXPERIMENT I, COLLEGE *S*s

2. *Experiment II*

Under Conditions H, M, and L the mean number of trials to the learning criterion were fourth graders—8.3, 18.6, 24.2; seventh graders—3.8, 12.9, 21.0; and tenth graders—4.6, 12.4, 20.5. Analysis of variance and a Duncan Range Test indicated that, for all grades, the three approximation levels differed significantly from one another. The fourth graders took significantly longer ($F = 8.18$; $df = 2, 153$) to reach criterion on their lists (17.0 trials) than did the seventh or tenth graders (12.6 and 12.5 trials). Grade and Approximation Level did not interact ($F < 1$). Thus, although the relative difficulty of the lists of three approximation levels was the same for the three grades, the fourth graders were confronted with the most difficult task overall.

Analysis of mean correct responses suggested significant effects of Grammatical Class ($F = 4.17$; $df = 4, 612$), and the interaction of Grade and Grammatical Class ($F = 1.56$; $df = 8, 612$). A Duncan Range Test of the ordered interaction means specified this situation (classes underlined by the same line do not differ):

fourth—N Aj F V Av; seventh—N V Av Aj F; and tenth—V N F Aj Av.

For the fourth-grade *S*s the effect was reasonably consistent with earlier findings (8), in that nouns were least difficult and adverbs most difficult to learn. Grammatical classes were clearly undifferentiated in difficulty for seventh graders. In the case of tenth-grade *S*s, the sole difference of greater ease of verbs over adverbs as learning material was inconsistent with previous findings and may represent a chance result.

The per cent correct serial position distribution evinced a less-bowed curve for higher approximations to sentence word-order (Figure 2a; $F = 8.72$; $df = 28, 2142$). Serial Position also interacted with Grade ($F = 2.45$; $df = 28, 2142$). This interaction is shown in Figure 2b. The curve for fourth graders is less skewed than those for seventh and tenth graders. Although not shown here, the curve for college *S*s (Experiment I) coincided with those for the seventh- and tenth-grade *S*s. The triple interaction, Serial Position by Grade by Approximation Level, was significant ($F = 2.21$; $df = 56, 2142$) and examination of serial position curves for this interaction suggested that the major source of divergence of fourth graders' data from those of older *S*s occurred under Condition H lists, the fourth graders' curve being more bowed than those of the older *S*s.

An examination of the types of errors made revealed that omissions and intralist intrusions accounted for virtually all of *S*s' errors (79 and 20 per cent, respectively). Very few errors occurred in the form of grammatical transformation of words in the list or extralist words. There was no evidence of change in error tendencies within the age range examined or as a function of approximation level, with the small exception of increased frequency of extralist intrusions when learning Condition H lists (6 per cent *versus* less than 1 per cent under Conditions M and L). In the case of intralist intrusions, there was also no evidence of systematic substitution of grammatical classes: e.g., nouns did not tend to be replaced by other nouns or by any other particular grammatical class.

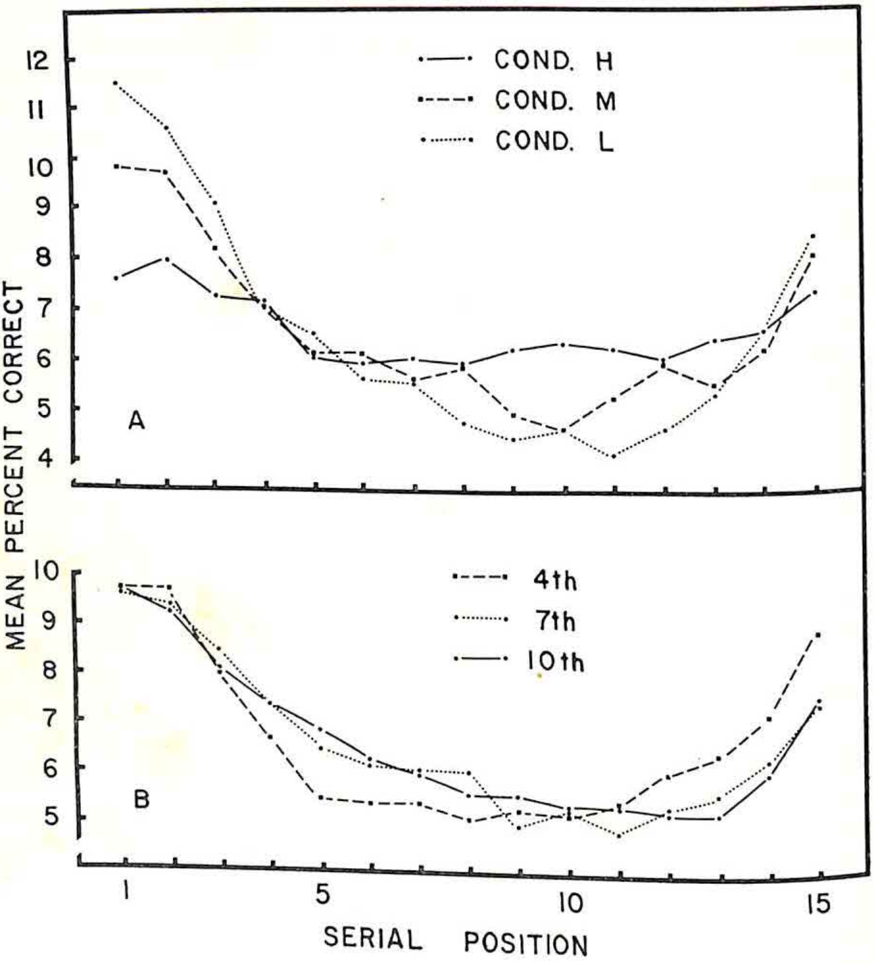

FIGURE 2

(*a*) Mean Per Cent Correct Responses at Each Serial Position for High (H), Medium (M), and Low (L) Approximations to Sentence Word-Order; Experiment II, Fourth-, Seventh-, and Tenth-Grade *S*s. (*b*) Mean Per Cent Correct Responses at Each Serial Position for Fourth-, Seventh-, and Tenth-Grade *S*s

D. Discussion

Analysis of the number of trials required to reach the learning criterion suggested that serial anticipation learning of a 15-word list is a more difficult task for fourth graders than it is for older *S*s. Another reflection of the greater difficulty of the fourth graders' learning material is a comparison of median length of sentences used in compositions written by fourth, seventh, and tenth graders, from which the learning material was taken. While the medians for tenth and seventh graders (16 and 13 words, respectively) were close to the 15-word experimental-list length, the median for fourth graders was only nine words. This suggests a possible reconciliation of the present results with previous ones involving 30-word lists (8). Learning a 30-word list is a more difficult task than the present one involving 15-word lists. In the more difficult task grammatical-class differences appeared. In the present study, the learning task was more difficult for fourth graders than for older *S*s and it is with the fourth graders that grammatical-class differences are most obvious. Apparently, this variable is influential only in learning tasks of relatively great difficulty.

If the words sampled from fourth-grade compositions happened to be lower in frequency of usage than those sampled from seventh- and tenth-grade writing, this might explain the observed discrepancy in difficulty. Thorndike-Lorge (10) general-count word frequencies were tabulated for the experimental lists and the investigator used A = 50 and AA = 100. The mean word frequencies for fourth-, seventh-, and tenth-grade lists were 91, 88, and 83, a difference in the direction indicating less difficult material for the lower grade levels. Thus, frequency of usage of individual words is not a causal factor in the present results.

The role of task difficulty may also play a role in the Serial Position by Grade differences noted in Experiment II. Although several dimensions of task difficulty (e.g., meaningfulness, presentation rate) have failed to yield differences in relative serial position curves, McManis (5, 6) has presented evidence for a decrease in skew with increasing list length (another dimension of task difficulty). The less-skewed curves for fourth graders may therefore be another reflection of the greater difficulty of the learning material for these *S*s. The idea of a shift in skew with age change is not original. Lepley (4) published a similar shift in the serial position error curve with *S*s of different ages.

Beyond these indications of greater task difficulty for the youngest *S*s, the present results rather impressively indicate the early maturation of language habits, at least as they affect serial verbal learning. Evidence for interaction of age with grammatical-class or word-order is much less than had been predicted, being restricted to divergence of the fourth-grade data from those of the three older groups. Perhaps the upper limit of "grammar school" is quite literally that.

E. SUMMARY

Fourth-, seventh-, tenth-grade, and college *S*s learned 15-word lists by the method of serial anticipation. Increasing the approximation of the list to sentence word-order produced a less-bowed serial position distribution of per cent correct responses. Fourth-grade *S*s produced a less-skewed serial position curve, suggesting greater difficulty of the task for these *S*s. Differences in ease of learning words of various grammatical classes also appeared for the youngest *S*s, but not for the oldest *S*s.

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EFFECTS OF PLACEBO, DEXAMYL, AND LUCOFEN ON MOODS, EMOTIONS, AND MOTIVATIONS*[1]

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A. INTRODUCTION

This paper is one in a series using essentially identical methods to study methodological problems of drug research and the actions of certain medications (1, 2, 3, 4, 5). These procedures were successful in meeting two criteria: to eliminate placebo effects; to make a sensitive assessment of drug-induced changes in a wide variety of moods, emotions, and motivations.

This report describes the effects of placebo and of two appetite suppressants, Dexamyl,[2] and Lucofen,[3] on 39 male and 39 female college students who were 21 years or older. Each volunteer received three placebo treatments and one each of Dexamyl and Lucofen, interspersed among other treatments (see B.). Comparison data of the effects of Dexedrine[4] alone are included.

The data presented are from two adjective checklists. The short, forced-choice adjective checklist (ACL) (4, p. 207) contains 32 pairs of self-descriptive adjectives plus other questions: e.g., degree of subjective awareness of drug effect. The long, free-choice adjective checklist (4, p. 205) gives the subject the opportunity to select which of 133 adjectives apply to his feelings at that time.

B. PROCEDURES

The procedures of this study were substantially identical with previously reported studies. Each *S* served for 15 sessions, separated by two or more days, during which a variety of experimental and control doses were used (placebo, dimenhydrinate, dextroamphetamine, a variety of weak analgesics, and the treatments that are the subject of this paper). The *S*s were assigned different drug sequences so as to counterbalance possible variable factors. On each day the *S* came twice—once in the late morning, when he filled out report forms, completed a free-choice ACL, and took his medication; again, two hours after medication, to report on the two "outpatient" hours and to complete both a free-choice ACL and a forced-choice ACL. The method was modified double-blind. Complete details of methods appear in earlier papers (2, 3, 4, 5). All *S*s completed all scheduled sessions.

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* Received in the Editorial Office, Provincetown, Massachusetts, on April 3, 1967, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] This paper is number XI of a series, "Chemical Studies of Behavior." The data here reported are part of a larger study carried out in 1965-1966. Support came from Menley & James and Smith Kline & French Laboratories and from the University of Rochester. The original data were independently processed by the authors and by the Statistics Sections of their sponsors.

[2] Dexamyl: Smith Kline & French Laboratories.

[3] Lucofen, chlorphentermine HCl, is sold by Wm. R. Warner Co., Ltd. in England. The drug is sold in the U.S. by Warner-Chilcott Laboratories under the name Pre-Sate.

[4] Dexedrine: Smith Kline & French Laboratories.

The placebo capsules and the capsules containing the two appetite suppressants were identical in appearance. The placebo capsules contained milk sugar and the other capsules contained dextroamphetamine (5 mg) plus amobarbital (30 mg) or chlorphentermine (25 mg), prepared from commercially available material.

C. RESULTS

1. *Results from the Short, Forced-Choice ACL*

a. Introduction. The forced-choice ACL consists of 32 pairs of adjectives arranged in alphabetical order: i.e., active-energetic, angry-annoyed, anxious-fearful, etc. It is administered in each posttreatment session. The subject is required to make a judgment for each pair of adjectives of "whether you felt more that way before the drug took effect or whether you feel more that way now." This is done by circling either the word "before" or the word "now" adjacent to the adjective pair. In addition, *S*s answer three other questions: (*a*) Which way of feeling did you like better? Before Now . (*b*) Do you believe that you felt any drug effects today? None____ Slight____ Moderate____ Strong____. (*c*) Completing this list today was: Difficult____ Moderately difficult____ Moderately easy____ Easy____.

b. Placebo, Dexamyl, and Lucofen results on the forced-choice ACL. The data from males and females are being presented separately because the authors are not yet in a strong enough position (with sufficient replication to ascertain whether there are or are not differences in either preexisting emotional states or drug response) to warrant combining the two groups. Table 1 presents the results from the male subjects and Table 2 the results for female subjects.

The 33 items of the ACL have been arranged into two major divisions: the first 16 items are normally associated with positive emotional states, the second group of 16 items are normally associated with negative states. One item, intoxicated-light-headed, is separate because it can be associated with either positive or negative changes and is most often used by subjects to reflect the degree to which they feel affected by a drug.

TABLE 1

FORCED-CHOICE ADJECTIVE CHECKLIST: MALE DATA COMPARING PLACEBO, DEXAMYL, AND LUCOFEN

Adjective pair	% "Nows" after placebo ($N = 117$)	% "Nows" after Dexamyl ($N = 39$)	Dexamyl-placebo diff.	t	% "Nows" after Lucofen ($N = 39$)	Lucofen-placebo diff.	t
1. active—energetic	52	67	+15		38	—14	*
2. cheerful—happy	61	74	+13		49	—12	
3. decisive—capable	60	79	+19	+2.39	59	— 1	
4. easygoing—relaxed	68	82	+14		51	—17	
5. egotistic—boastful	47	64	+17		44	— 3	
6. effective—efficient	59	77	+18	+2.21	56	— 3	
7. genial—friendly	62	72	+10		51	—11	
8. humorous—witty	57	64	+ 7		44	—13	
9. industrious—work-oriented	55	64	+ 9		49	— 6	
10. optimistic—high-spirited	55	74	+19	+2.26	51	— 4	
11. quiet—peaceful	64	49	—15		67	+ 3	
12. reckless—uninhibited	51	56	+ 5		41	—10	
13. self-confident—courageous	60	74	+14		46	—14	
14. sympathetic—considerate	59	67	+ 8		51	— 8	
15. talkative—chatty	49	69	+20	+2.29	41	— 8	
16. which way better	58	77	+19	+2.33	49	— 9	
17. intoxicated—light-headed	60	64	+ 4		51	— 9	
18. angry—annoyed	40	23	—17	—2.09	49	+ 9	
19. anxious—fearful	44	23	—21	—2.58	41	— 3	
20. bored—uninterested	50	33	—17		56	+ 6	
21. confused—disorganized	38	23	—15		38	0	
22. disturbed—upset	38	18	—20	—2.63	51	+13	
23. downhearted—sad	44	26	—18	—2.15	49	+ 5	
24. drowsy—sleepy	48	31	—17		62	+14	
25. dull—sluggish	47	33	—14		59	+12	
26. gloomy—blue	46	28	—18	—2.11	44	— 2	
27. grouchy—irritable	38	18	—20	—2.63	51	+13	
28. impatient—snappish	45	18	—27	—3.52	49	+ 4	
29. jittery—nervous	49	21	—28	—3.50	44	— 5	
30. pain—discomfort	45	23	—22	—2.70	49	+ 4	
31. resentful—indignant	42	21	—21	—2.64	56	+14	
32. self-conscious—timid	38	18	—20	—2.63	49	+11	
33. tired—washed-out	50	31	—19	—2.18	64	+14	

* None of the differences between Lucofen and placebo reached significance.

TABLE 2
FORCED-CHOICE ADJECTIVE CHECKLIST: FEMALE DATA COMPARING PLACEBO, DEXAMYL, AND LUCOFEN

Adjective pair	% "Nows" after placebo ($N = 117$)	% "Nows" after Dexamyl ($N = 39$)	Dexamyl-placebo diff.	Dexamyl-placebo t	% "Nows" after Lucofen ($N = 39$)	Lucofen-placebo diff.	Lucofen-placebo t
1. active—energetic	52	72	+20	+2.34	49	— 3	*
2. cheerful—happy	59	72	+13		67	+ 8	
3. decisive—capable	52	79	+27	+3.38	59	+ 7	
4. easygoing—relaxed	57	67	+10		64	+ 7	
5. egotistic—boastful	44	72	+28	+3.28	54	+10	
6. effective—efficient	54	77	+23	+2.82	54	0	
7. genial—friendly	62	82	+20	+2.63	64	+ 2	
8. humorous—witty	55	74	+19	+2.26	56	+ 1	
9. industrious—work-oriented	53	79	+26	+3.25	56	+ 3	
10. optimistic—high-spirited	55	79	+24	+3.01	62	+ 7	
11. quiet—peaceful	58	49	— 9		59	+ 1	
12. reckless—uninhibited	48	69	+21	+2.40	62	+14	
13. self-confident—courageous	54	82	+28	+3.64	64	+10	
14. sympathetic—considerate	53	69	+16		51	— 2	
15. talkative—chatty	52	77	+25	+3.06	54	+ 2	
16. which way better	54	74	+20	+2.38	64	+10	
17. intoxicated—light-headed	60	62	+ 2		67	+ 7	
18. angry—annoyed	42	31	—11		28	—14	
19. anxious—fearful	40	36	— 4		33	— 7	
20. bored—uninterested	42	23	—19	—2.33	38	— 4	
21. confused—disorganized	47	28	—19	—2.22	36	—11	
22. disturbed—upset	38	26	—12		36	— 2	
23. downhearted—sad	43	23	—20	—2.46	31	—12	
24. drowsy—sleepy	47	31	—16		44	— 3	
25. dull—sluggish	46	28	—18	—2.11	49	+ 3	
26. gloomy—blue	49	26	—23	—2.74	36	—13	
27. grouchy—irritable	38	23	—15		26	—12	
28. impatient—snappish	43	33	—10		33	—10	
29. jittery—nervous	48	33	—15		44	— 4	
30. pain—discomfort	43	33	—10		33	—10	
31. resentful—indignant	36	31	— 5		26	—10	
32. self-conscious—timid	44	21	—23	—2.89	31	—13	
33. tired—washed-out	45	28	—17	—1.99	51	+ 6	

* None of the differences between Lucofen and placebo reached significance.

The two tables show the list of items on the left. The first column gives the percentage choosing "now" after placebo. The second gives the percentage of "nows" after Dexamyl, the third gives the differences between Dexamyl and placebo, the fourth and fifth columns give the percentages of "nows" after Lucofen and its placebo differences respectively.

The placebo data reflect a slight shift toward a relaxed positive mood with the majority of men and women feeling easygoing-relaxed (68 per cent and 57 per cent respectively) and genial-friendly (62 per cent for both), and relatively few feeling disturbed-upset (38 per cent for both groups) and grouchy-irritable (38 per cent for both). The tendency for a positive shift is somewhat more pronounced for the men than for the women.

A single administration of Dexamyl to groups of 39 *S*s was completely adequate to yield clearcut results. The treatment was very positively and comfortably received. The comparison with placebo percentages shows that all positive states are higher after Dexamyl (with the exception of quiet-peaceful) and that all negative states are lower, for both male and female volunteers.

The correlation of "now" responses after Dexamyl for men *vs.* those for women is $r = +.95$ for the 33 items of the list.

It is worth noting that volunteers who normally feel a slight preponderance of positive emotional states after placebo experience a favorable response after Dexamyl without feeling prominent drug effects. This is shown by inspection of the item, "Do you believe that you felt any drug effects today? None____ Slight____ Moderate____ Strong____."

Thirty-eight per cent ($N = 234$) of *S*s feel effects after placebo, 50 per cent ($N = 78$) after Dexamyl, and 69 per cent ($N = 156$) after Dexedrine; and the drug-placebo difference after Dexamyl is +12 per cent (nonsignificant) and after Dexedrine +31 per cent ($t = +6.36$).

The Lucofen results are not conclusive: the female data show a slight positive reaction, the male data a slight negative one, neither significantly different from placebo. Either Lucofen has weak effects or is inadequately measured in a single administration (chronic administration or replication of stat doses may clarify the nature of effects).

2. *Results from the Long, Free-Choice ACL*

a. Introduction. The free-choice ACL consists of 133 adjectives alphabetically listed—i.e., active, affectionate, agreeable, ambitious, etc.—in vertical columns. The *S* checks or double-checks each adjective that describes his feelings at that time. The free-choice ACL is completed twice by the *S*, once before and once two hours after drug, yielding a *change score* for each of the adjectives, which can then be totalled for the group of *S*s.

b. Change scores after placebo. The placebo data in this study are similar to our previous findings. The only consistent pattern other than random changes is that of postlunch relaxation with a small increase in check marks for such adjectives as indifferent, sleepy, subdued, and withdrawn for the males and languid, drowsy, tired, and headachy for the females. There is a small decrease in check marks for such adjectives as dissatisfied, energetic, keyed-up, and genial for the males and, similarly for the women, hard-working, work-oriented, and ambitious.

c. Change scores after Dexamyl. For both men and women, the 133 adjectives sort into two major divisions: the majority of positive or desirable adjectives show an increase in check marks and the negative adjectives have a decrease in check marks. The subjects felt more agreeable, sociable, friendly, and easygoing; they felt less uneasy, dissatisfied, tired, and drowsy.

d. Change scores after Lucofen. The free-choice ACL change scores after Lucofen similarly resemble the forced-choice ACL data. A slight negative pattern emerges for the men with an increase in check marks for such adjectives as sluggish, subdued, irritable, and confused and a decrease for hard-working, easygoing, work-oriented, and efficient. A pattern consistent with the forced-choice ACL is also shown for the women—a slight positive shift, but not much greater than after placebo.

e. Total change scores for a priori *clusters.* Twelve groups of adjectives have been selected from the ACL to represent meaningful emotional and motivational states. (Needless to say, it is an easier task to compare 12 cluster scores rather than to undertake the formidable chore of comparing 133 change scores.) In addition to this simplification, the authors have in this instance combined the results of male and female subjects with the intention of providing an overview comparison of placebo, Dexamyl, and Lucofen. Table 3 presents key adjectives for each cluster, the number of such adjectives in each, and the total change score per cluster for the three treatments. The totals for 234 placebo determinations have been adjusted to an N of 78 to match the number of determinations of each drug. The 12 clusters have arbitrarily been arranged in rank order from that which increased most to that which decreased most after Dexamyl. Figure 1 shows the same data graphically.

3. *Comparison of Dexamyl and Dexedrine*

Since data on the effects of Dexedrine are available from the same experiment, it is interesting to note whether the difference between it and Dexamyl can be detected; and, if so, what its nature is. Since the data show the effects of the two preparations to be different, does the difference make sense pharmacologically and emotionally?

TABLE 3

FREE-CHOICE ADJECTIVE CHECKLIST

Total change scores in *a priori* clusters after Dexamyl, placebo, and Lucofen

Type of adjective and number of adjectives in cluster	Dexamyl ($N = 78$)	Placebo ($N = 234$, adjusted to $N = 78$)	Lucofen ($N = 78$)
1. Friendly, good-natured, trustful, warm-hearted (17)	+103	—22	— 36
2. Elated, enthusiastic, self-confident, uninhibited (14)	+ 93	—27	— 12
3. Calm, dreamy, drifting, relaxed (14)	+ 87	—22	+ 4
4. Active, ambitious, energetic, industrious (13)	+ 65	—62	—107
5. Assertive, decisive, egotistic, boastful (12)	+ 3	—17	— 8
6. Light-headed, dizzy, headache (6)	— 1	+11	+ 41
7. Disturbed, nervous, uneasy, upset (11)	— 25	—24	+ 2
8. Drowsy, lazy, sleepy, sluggish (8)	— 31	+37	+ 32
9. Apathetic, bored, indifferent, withdrawn (11)	— 31	+17	+ 31
10. Apprehensive, careful, self-conscious (9)	— 33	—15	— 19
11. Blue, depressed, guilty, unhappy (9)	— 36	0	— 11
12. Angry, belligerent, defiant, sarcastic (9)	— 44	—14	+ 3

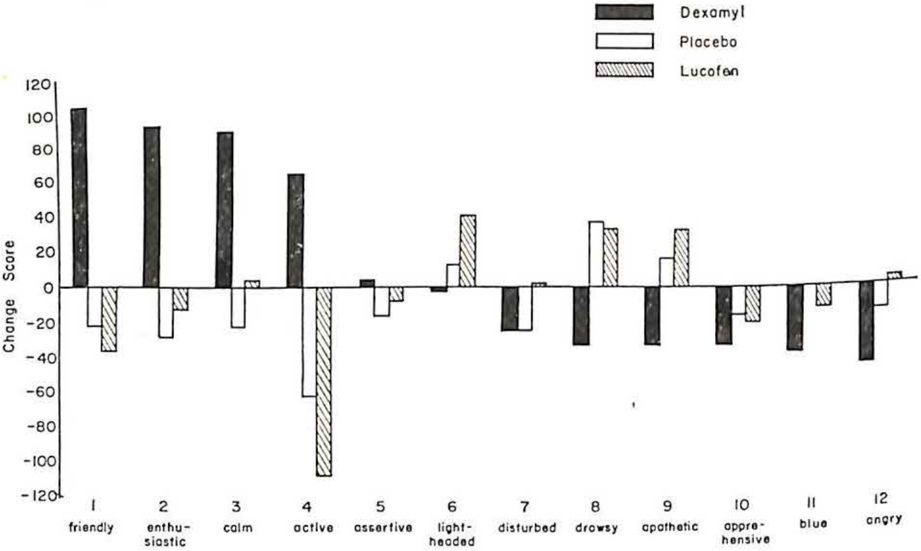

FIGURE 1
TOTAL CHANGE SCORES IN *a Priori* CLUSTERS AFTER DEXAMYL ($N = 78$), PLACEBO ($N = 234$ ADJUSTED TO $N = 78$) AND LUCOFEN ($N = 78$)

a. Results from forced-choice ACL, comparing Dexamyl and Dexedrine. Of the 33 items on the list, there are 18 that show essentially no difference between the compounds, the percentages of "now" responses having differences of zero to ± 4 per cent between the two treatments. The remaining 15 taken as a group indicate, in the authors' opinion, what function the amobarbital serves in combination with Dexedrine. Table 4 displays these data.

Subjectively and objectively, the personality shift after Dexamyl has a more socially acceptable balance than that after Dexedrine. The subjects are obviously more comfortable and not as driven; the small increments in drowsiness and tiredness still leave the *S*s well below their reported percentages after placebo. One might describe the difference by noting that the addition of amobarbital files off the rough edges of the Dexedrine effects.

b. Results from free-choice ACL. A comparison between drug effects as determined by the two ACLs is best summarized by presentation of the change scores for the 12 *a priori* clusters of the free-choice ACL. Table 5 shows that these results are in agreement on each of the 12 clusters with those from the forced-choice ACL, given in Table 4.

The effects of Dexamyl are different from those of Dexedrine. The nature of the change in the Dexedrine effect, introduced by the addition of amo-

TABLE 4

FORCED-CHOICE ADJECTIVE CHECKLIST: DATA COMPARING DEXAMYL AND DEXEDRINE

Adjective pair	% "Nows" after Dexamyl ($N = 78$)	% "Nows" after Dexedrine ($N = 156$)	Dexamyl-Dexedrine difference	*t*
Positive items:				
1. active—energetic	70	78	— 8	
2. easygoing—relaxed	74	56	+18	+2.83
3. egotistic—boastful	68	74	— 6	
4. humorous—witty	69	74	— 5	
5. quiet—peaceful	49	38	+11	
6. talkative—chatty	70	78	— 8	
7. intoxicated—light-headed	63	71	— 8	
Negative items:				
8. bored—uninterested	28	14	+14	+2.42
9. disturbed—upset	22	32	—10	
10. drowsy—sleepy	31	24	+ 7	
11. dull—sluggish	30	22	+ 8	
12. grouchy—irritable	20	26	— 6	
13. impatient—snappish	26	34	— 8	
14. jittery—nervous	27	46	—19	—2.96
15. tired—washed-out	30	24	+ 6	
% subjects reporting a drug effect	50	69	—19	—2.81

TABLE 5

FREE-CHOICE ADJECTIVE CHECKLIST

Total change scores in *a priori* clusters after Dexamyl and Dexedrine

Type of adjective and number of adjectives in cluster	Dexamyl ($N = 78$)	Dexedrine ($N = 156$, adjusted to $N = 78$)	Dexamyl-Dexedrine difference
1. Friendly, good-natured, trustful, warm-hearted (17)	+103	+ 84	+ 19
2. Elated, enthusiastic, self-confident, uninhibited (14)	+ 93	+151	— 58
3. Calm, dreamy, drifting, relaxed (14)	+ 87	— 24	+111
4. Active, ambitious, energetic, industrious (13)	+ 65	+109	— 44
5. Assertive, decisive, egotistic, boastful (12)	+ 3	+ 83	— 80
6. Light-headed, dizzy, headache (6)	— 1	+ 39	— 40
7. Disturbed, nervous, uneasy, upset (11)	— 25	+ 18	— 43
8. Drowsy, lazy, sleepy, sluggish (8)	— 31	— 49	+ 18
9. Apathetic, bored, indifferent, withdrawn (11)	— 31	— 56	+ 25
10. Apprehensive, careful, self-conscious (9)	— 33	— 21	— 12
11. Blue, depressed, guilty, unhappy (9)	— 36	— 22	— 14
12. Angry, belligerent, defiant, sarcastic (9)	— 44	— 13	— 31

barbital, does make sense. Furthermore, the socially irritating effects of Dexedrine (assertiveness, egotism, talkativeness, lack of inhibitions) are reduced.

D. COMMENTS

1. Based on this experiment, one should not assert that the effects of Lucofen on emotional states differ from placebo. While women showed a slight positive reaction and men a slight negative reaction, the difference should be confirmed before acceptance.

2. Dexamyl had uniformly desirable effects on both male and female normal subjects, characterized by feeling agreeable, sociable, friendly, and easygoing, and by reduction of negative emotions.

3. The emotional and personality change after Dexamyl differed from that after Dexedrine in that some socially abrasive changes found after Dexedrine were not present after Dexamyl.

4. Subjects less often reported a belief that they have had a drug after Dexamyl than after Dexedrine.

5. This experiment included triple-control treatments (a sedative, a stimulant, and placebo) which yielded results typical of those obtained by this laboratory over a period of 14 years of experimentation, thus suggesting that the data on the new drugs are valid.

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THE SOCIAL INTELLIGENCE OF STUDENTS*

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A. THE PROBLEM

For a number of years the author has been interested in students' motivation for taking particular courses. One of the instruments used to study this was the Social Intelligence Test (3), and the author was struck by the fact that students taking social psychology continually had scores above the average. Is there any significance in this? If so, can we conclude (*a*) that the students' interest in social psychology stems from a realization of superior social intelligence? (*b*) that the degree of social intelligence is related to general intelligence, as suggested by Hunt (1)?

B. PROCEDURE

The Social Intelligence Test (SIT) was administered by the author to a social psychology class at three different institutions: University of Guelph, University of Manitoba, and St. John's College, Winnipeg. Each class took the test as a group within two weeks of the start of the course. During the next month each class also took the Wechsler Adult Intelligence Scale (WAIS). The same procedure was followed with an economics class at Guelph, an English class at St. John's, and an architecture and a mathematics class at Manitoba, to provide a control sample.

C. RESULTS

Equal numbers of both sexes were chosen from the test results of each class, with the use of a table of random numbers. The data were first set up as shown in Table 1, with $n = 10$ in each cell, and a $2 \times 2 \times 3$ factorial analysis of variance was performed. The effects of sex and course were significant beyond the .005 level ($F_{\text{sex}} = 3.62$, $F_{\text{course}} = 10.9$, $df = 1{,}108$). None of the other sources of variation was significant.

A similar $2 \times 2 \times 3$ factorial analysis of variance was performed using the WAIS scores. None of the other sources of variation was significant, which implies that the *IQ* scores of social psychology students are on a par with those of other students.

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TABLE 1

MEANS OF SOCIAL INTELLIGENCE TEST SCORES FOR SECOND- AND THIRD-YEAR MALE AND FEMALE (B.A. ORD.) STUDENTS IN SOCIAL PSYCHOLOGY AND OTHER COURSES AT THREE DIFFERENT UNIVERSITIES

	Females		Males	
University	Soc. Psychol.	Other	Soc. Psychol.	Other
Manitoba	33.56	26.55	31.33	21.44
St. John's	30.22	28.67	27.03	23.56
Guelph	31.67	23.89	22.44	20.11

Finally, the SIT scores were correlated with scores on the two divisions of WAIS. For the verbal tests $r = .61$ (significant beyond .01 level for a two-tailed test), and for the performance tests $r = .13$ (almost significant at the .05 level).

D. DISCUSSION

From the results we can conclude that female students score significantly higher on the SIT than males. Furthermore, social psychology students tend to score significantly higher than others. When all students are measured with the WAIS, no difference is found between any groups.

This might lead one to assert that social and general intelligence are reasonably distinct entities. But a correlation between SIT and WAIS scores shows a strong relationship on the verbal factor, as previously found by Thorndike (4) and Woodrow (5). The relationship is less strong on the performance factor.

It would seem then that the correlations reported in the SIT Manual (3) between SIT and general intelligence tests are due largely to the overriding influence of verbal ability. This need not mean that McClatchy's (2) criticisms of the concept of social intelligence are justified, since this study did differentiate social psychology students from others on the basis of the SIT. Instead it shows either that the SIT is an imperfect instrument for measuring social intelligence or that the latter is not a pure factor.

E. SUMMARY

The Social Intelligence Test and the Wechsler Adult Intelligence Scale were given to students of social psychology and other fields. SIT was found to differentiate the two types of students, but WAIS did not. It was found, however, that there is a positive relationship between the two tests.

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PEER ACCEPTANCE AND UNDER- AND OVER-ACHIEVEMENT IN SCHOOL*

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A. INTRODUCTION

Achievement in school represents an important issue in the lives of most children. Some cannot learn, some will not, some do brilliantly, and many plod along the relatively uneventful course called average. Of particular interest to the psychologist, because of the potential for behavior problems, are children who perform in school at a level either above or below their demonstrated intellectual ability. The underachiever has been of particular concern; and much research has been accomplished on factors, such as personality (1, 10, 11), home environment (7, 8, 12), and study habits (3, 5), believed to influence underachievement. On the other hand, the overachiever, probably because he is viewed as "trying hard," has received relatively little attention. Yet, it is reasonable to assume that such overachieving children may, in the long run, present the more serious psychological problems, particularly in those areas affecting personal adjustment and interpersonal relationships.

The present study constitutes an attempt to examine the peer relationships of both under- and over-achievers. As society is organized, that which is learned often has to find its use by the learner in a social context and, for that reason, ability to relate to others both in work and in play is an important aspect of a child's development. For most children the peer group represents the primary training opportunity in learning to deal acceptably and successfully with others. Under the circumstances it seems reasonable to assume that the regard with which a child is held by his peers could be a factor in achieving up to his potential. If one is worrying about one's peer status, it might well be difficult to concentrate on schoolwork. On the other hand, it is possible that too much social acceptance might affect achievement adversely with the result that a curvilinear relationship would exist. The present study explores this possibility through the computation of Eta for the relationship between peer popularity and under- and over-achievement.

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Several previous studies are pertinent. Schmuck (9) found that utilization of existent academic ability is related to liking status (peer approval). Students who thought they were not liked, whether or not they actually were, utilized their abilities less well than did students who thought that they were liked. Epperson (4) reported that underachievement was related to alienation (exclusion and powerlessness). Teacher exclusion was found to be more highly related to underachievement than peer exclusion.

In a sample of gifted second through fifth graders, a high correlation ($p <$ .001) was found between perceived peer popularity and overachievement as measured by the Horn Formula (2). Keislar (6) administered a "Guess Who" type test to intellectually matched groups of girls who had displayed differential achievement. The girls with high achievement were rated as being more friendly and welcome, but were considered to be less popular with boys. Peer popularity was not found to be related to achievement for two comparably matched groups of boys. However, when Eta was computed to see if there was a curvilinear relationship, it was found to be significant at the .05 level.

B. Method

The sample consisted of five classes each of ninth graders ($N = 115$) and 12th graders ($N = 116$) enrolled in a central Ohio high school of about 550 students. The school draws many types of students ranging from farm children to children of fairly wealthy parents. The Syracuse Scale of Social Relations (SSSR) was administered to the subjects at the end of the third month of school. The SSSR has the advantage of utilizing a reference population that is personal to the student. He rates each of his classmates on how they meet his needs for succorance compared to everyone else he has ever known. They, in turn, rate him. Thus, a median score made by each pupil (how he perceives his peers as meeting his needs) is compiled, and also a median score received (how his peers perceive him as meeting their needs). Recent results of intelligence tests were available in the students' folders. The freshmen had received the California Test of Mental Maturity (CTMM). The seniors had taken the Ohio State Psychological Examination (OSPE). Total honor points were computed for each student for the previous year, leaving out such subjects as band, chorus, and physical education. A grade-point average (GPA) was then computed. The freshmen and seniors were ranked within their classes on intelligence and on GPA and the differences in ranks were obtained by subtracting GPA rank from intelligence rank. Thus, the higher the positive discrepancy in ranks, the larger the overachievement; and the larger the negative discrepancy in ranks, the larger the underachievement. These discrepancy scores were then correlated to median score received and median score made on the SSSR. Etas were then computed to determine if the relationships might be more curvilinear than straight line.

C. RESULTS

As mentioned above, discrepancy between rank on intelligence and rank on GPA was found for each student. Positive discrepancy scores indicated overachievement. The correlation between discrepancy scores and median scores received was .10 for ninth graders. This is, of course, not significant. The relationship was then tested for curvilinearity. Eta was found to be .24 for regression of median score received on discrepancy and .36 for discrepancy on median score received. The former is significant at the .05 level and the latter at the .01 level, but neither is significantly larger than the corresponding Pearson r. See Table 1.

For 12th graders the Pearson r was .02 for median score received related to overachievement. The Etas in this case were both .22, which, although significant at the .05 level, are not significantly larger than the Pearson r of .02.

Next, median score made was investigated as it related to overachievement. For ninth graders, Pearson r was .15, which is not significant. Eta for the regression of median score made on discrepancy was .37, while the regression of discrepancy on median score made was .34. Both scores are significant at the .01 level. However, they are not significantly larger than the Pearson r of .15. Hence we cannot statistically justify the assumption of curvilinearity.

For 12th graders, the Pearson r between median score made and overachievement was .04. The Etas for the regression of median score made on discrepancy and *vice versa* were .35 and .31 respectively. Although both are significant at the .01 level, neither is significantly larger than the Pearson r to justify the assumption of curvilinearity.

Since it is difficult for a person who ranks close to the top on intelligence to overachieve and for a person who ranks close to the bottom to underachieve, the two classes were divided into three groups each—high, average, and low intelligence—to see if there were any differences in thir patterns of over- and under-achievement and peer relationships. Almost all of the correlation coefficients turned out to be positive, but not significant, just as had been the case with all of the groups originally combined.

As a group, girls were found to be overachievers much more frequently than boys ($p < .05$ for the obtained χ^2). This finding was based on the combined sample of ninth and 12th grade boys *vs.* the combined ninth and 12th grade girls.

TABLE 1
RELATIONSHIPS BETWEEN UNDER- AND OVER-ACHIEVEMENT AND PEER ACCEPTANCE BASED ON A SUCCORANCE CRITERION

Variables	Eta	Level of significance	Pearson *r*	Level of significance	Significance of difference between Eta and Pearson *r*
		Grade 9			
Mdn. score received on discrepancy (Intell.—GPA)	.24	.05	.10	NS	NS
Discrepancy on Mdn. score received	.36	.01	.10	NS	NS
Mdn. score made on discrepancy (Intell.—GPA)	.37	.01	.15	NS	NS
Discrepancy on Mdn. score made	.34	.01	.15	NS	NS
		Grade 12			
Mdn. score received on discrepancy (Intell.—GPA)	.22	.05	.02	NS	NS
Discrepancy on Mdn. score received	.22	.05	.02	NS	NS
Mdn. score made on discrepancy (Intell.—GPA)	.35	.01	.04	NS	NS
Discrepancy on Mdn. score made	.31	.01	.04	NS	NS

D. Discussion

It would seem that the most significant finding was that, while none of the Pearson *r*s for relationship between peer popularity and peer acceptance with overachievement were significant, all of the Etas were. Although none of the Etas were significantly larger than the Pearson *r*s, there was a trend towards curvilinearity. It would thus seem that popularity with one's peers (in terms of meeting their needs for succorance) is related to achieving to one's potential up to a point. Beyond this, if one is too popular, it may interfere with achievement. Too many friends and social events can prevent one from attaining to capacity. It would be interesting to see to what extent scholastic achievement might be affected if a highly popular group of underachievers had their social activities limited. Likewise, it would be interesting to see what would happen if unpopular underachievers were counseled on eliminating undesirable personality traits and helped to acquire social poise.

E. Summary

In an attempt to judge the peer acceptance status of under- and overachievers, the Syracuse Scale of Social Relations was administered to 231 ninth and 12th graders whose achievement status had been determined by computing discrepancies (as compared to their classmates' standings) between their intelligence-test performance and the average of their school grades. Etas were computed to check for curvilinearity of relationship. Significant Pearsonian *r*s were not found for any of the relationships investigated; and the Etas, while significant, were not significantly larger than the Pearsonian correlations. However, there appeared to be a trend toward curvilinearity leading to the tentative conclusion that popularity with one's peers in terms of meeting their need for succorance is related, up to a point, to achieving comparatively to the level of one's potential.

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THE INFLUENCE OF WORD FAMILIARITY IN STEREOTYPING A LEADER*

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A. INTRODUCTION

In recent years there have been numerous studies evaluating how people form impressions about the personalities of other people. It would appear from the results of these studies that raters are able to agree on personality traits from rather limited visual (pictures) cues and auditory (voices) cues (4, 5, 6). For example, Stritch, Frye, and Rabin (7) in a series of experiments controlled the effect of a central tendency response set and found consistently high agreement among raters. Frye (2) found that raters could agree on the picture of a "leader" when a number of pictures was presented, but the personality traits assigned to the perceived leader varied. Although these impressions are not often accurate, they do influence behavior.

The purpose of the present study was to replicate part of an earlier study (2) to determine if people agree in ranking of leaders based on limited cues and to evaluate the effect of word meaningfulness on agreement between raters in the assignment of traits to this leader. It was hypothesized that intersubject agreement would be greater with more familiar terms, such as "outgoing" or "talkative," and lower with less familiar terms, such as "exudative" or "loquacious."

B. PROCEDURE

The *S*s consisted of 87 students enrolled in the introductory psychology courses at Louisiana State University. The *S*s were randomly divided into three groups with 29 *S*s in each group. The groups were heterogeneous with regard to age and sex.

The *S*s were initially shown five pictures of male faces by an opaque projector and asked to rank them from one to five in terms of leadership ability. The picture of the most able leader was assigned a rank of five.

The five pictures were next presented one at a time and the *S*s were asked to rate each picture on 24 traits considered by *E* as related to leadership. The only difference between the groups was the list of traits received. The *S* was instructed to circle the number indicating the degree to which he believed the person being rated possessed the trait. The scale numbers were 1) None at all, 2) Very little, 3) Little, 4) Some, 5) Much, 6) Very much, 7) A great deal. Thus, for each trait there was a 7-point scale. Some of these traits were taken from factor analytic studies of leadership. Others were hypothesized as being negatively or positively related to leadership based on Bass' theory (1) of leadership and interpersonal relations.

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Based upon the original list of 24 traits (2), two additional lists of words differing in level of difficulty were developed. The three lists (A, B, and C) are shown in Table 1. The difficulty level was determined by the Thorndike-Lorge tables (8). List A contained very easy words found over 50 times per million; List B contained medium-difficulty words found less than 50 times per million; List C is a difficult list with words found at least once per four million. The mean word count values for the three lists were 49, 8.3, and 2.4 per one million.

TABLE 1
LEADERSHIP TRAITS INCLUDED IN EACH OF THE THREE RATING SCALES[a]

List A	List B	List C
1. friendly	amiable	warm-hearted
2. fair	impartial	unprejudiced
3. honest	dependable	inviolable
4. talkative	verbose	loquacious
5. kind	altruistic	eleemosynary
6. competitive	aggressive	emulous
7. cunning	hypocritical	sanctimonious
8. helpful	cooperative	accommodating
9. wise	intelligent	erudite
10. independent	selfish	egotistical
11. careful	cautious	heedful
12. original	creative	inventive
13. outgoing	extroverted	exudative
14. funny	comical	jocose
15. uniform	consistent	equivocal
16. weak	dependent	pendent
17. doubtful	suspicious	mistrustful
18. able	competent	efficacy
19. power	influential	ascendancy
20. imaginative	initiative	inchoate
21. developed	mature	well-developed
22. agreeable	conformity	coalescent
23. radical	eccentric	iconoclastic
24. rigid	authoritarian	dogmatic

[a] Each of the traits was followed by the numbers 1-7. The judges were asked to circle a number to indicate the degree to which the person possessed the trait.

C. Results and Conclusions

The results support Frye's (2) finding that raters agree in their perception of the leaders. The mean correlation computed between the ranking of the three groups of the five pictures in terms of perceived leadership ability was .98. This would tend to support the hypothesis that leadership stereotypes exist.

To analyze the relationship between perceived leadership and traits assigned to the three different lists, a Lindquist (3) Type VI analysis of variance was computed. As may be seen in Table 2, the three main effects were statistically significant. In addition, all of the interaction effects were significant beyond the .01 level.

TABLE 2
ANALYSES OF VARIANCE OF RATINGS BETWEEN TESTS, TRAITS, AND PICTURES

Source	*df*	*S*s	*M*s	*F*
Between subjects	86	3,300	38.37	1.38
Lists (L)	2	969	484.5	17.46**
Error (b)	84	2,331	27.75	
Within subjects	10,353	21,659	2.25	
Pictures (P)	4	71	17.75	2.95**
Traits (T)	23	936	40.7	28.07**
P × L	8	234	29.25	4.86**
T × L	46	415	9.02	6.22**
P × T	92	397	4.32	2.62**
P × T × L	184	553	3.00	1.82**
Error (w)	9,996	19,053	1.9	
Error (1)	336	2,024	6.02	
Error (2)	1,932	4,264	1.45	
Error (3)	7,728	12,765	1.65	
Total	10,439	24,959		

** $p < .01$.

The significant picture by trait by list interaction would indicate that the way *S*s rated a picture on a particular trait depended on the list used. This supports the hypothesis that familiarity with the concepts used in a list affects rater ability to describe a person.

In order to evaluate rater agreement on the three lists, agreement indices were computed for each of the traits on each list. The agreement was greatest for the most familiar list (List A) and lowest for the least familiar list (List C).

When the agreement indices computed for List A were compared with the agreement indices in Frye's study (2), the agreement as to the traits related to perceived leadership was high. In both studies such traits as friendly, outgoing, fair, honest, helpful, wise, original, developed, able, and powerful were rated high for a person rated as a leader and low for a person rated as a non-leader. Traits negatively related to leadership were doubtful, radical, and rigid. Some traits, such as careful and cunning, do not relate consistently with rated leadership. With List B and List C agreement indices were lower, and the agreement with Frye (2) was not high.

There was one interesting reversal: for trait number 15, the highest agreement was in the use of "consistent" (List B) and not "uniform" (List A). This, as well as relatively low correlations for several of the traits, suggests that word count may not be the most appropriate method for determining word familiarity. The Thorndike-Lorge word count does not take into account word usage, and an approach to be adequate in discovering words to be used in a fixed scale must take into account the situation in which the concept is used. For example, even though "uniform" has a higher word count, it was not perceived as appropriate as "consistent" for describing human behavior.

In general, the hypothesis that intersubject agreement would be greater with more familiar terms was supported, but important theoretical questions have been raised concerning the use of fixed descriptive trait scales. While fixed scales are easy to construct, easy to administer, and easy to analyze with existing statistical procedures, the underlying assumption often overlooked is that adjectival concepts used in a list are equally familiar to, and have the same connotations for, all judges (9). The results of the present study indicated that interrater agreement breaks down as the list of traits or their synonyms become more difficult for the rater to comprehend. The assumption of equality of meaning must be questioned with the implication that greater care is necessary in selecting terms used in a fixed scale. Since the Thorndike-Lorge word count does not appear to provide sufficiently common meaning, the selection of terms remains a problem.

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THE RELATIONSHIP OF MENTAL ABILITY TO ANAGRAM SOLVING*[1]

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A. INTRODUCTION

In spite of the fact that a large body of research data already exists on anagram solving behavior (4), relatively little is known about the relationship between solution success and the mental abilities. The most important findings from the few studies that are relevant to the question reveal that (*a*) the relationship between anagram solving and general mental ability is either absent (2, 3) or relatively low (7); and (*b*) anagram tests, when included in factor analysis studies of primary mental abilities, are located within the word fluency factor (8).

Although factorial studies, such as the one cited above, have yielded the most detailed information available on the subject, the anagram tasks that they employed were not, for the most part, representative of those typically used in problem solving research (4, p. 372). As a result, the data that these studies have provided are not directly applicable to the discovery of the mental abilities required in anagram solving experiments.

It is clear, therefore, that previous studies have not contributed sufficient knowledge with respect to the anagram solving abilities called for in the solution of standard anagram problems. Accordingly, correlational techniques were employed in the present study to determine the extent to which anagram solving skill is related to a variety of mental ability measures.

B. METHOD

1. *Tests*

a. Anagram test. The anagram test consisted of 60 five-letter, single-solution anagrams.[2] It was administered by means of two printed sheets: one

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[1] The author would like to thank Jeffrey Flatt, Robert Karp, Sheldon Schmidt, and Deborah Souberman for their help in administering and scoring the tests.

[2] During the course of the study it was discovered that three of the anagrams had dual solutions. Either solution was therefore scored as correct for each of these anagrams, although the occurrence of the unexpected solutions was relatively rare.

sheet containing the anagrams, the other containing numbered spaces for writing in the answers. The sheets were stapled together with the question sheet on top to prevent the exposure of the answer sheet. In this way the answer sheet remained covered, except for the brief period of time it took the subject to write in his answers. A total working time of 20 minutes was permitted.

Directions to the subject were given by the experimenter orally and included a definition of the word "anagram," a sample anagram problem and its solution, and a caution not to separate the question sheet from the answer sheet.

b. Tests of ability. A total of nine aptitude tests were employed. These included the Revised Minnesota Paper Form Board Test (MPFB), the Otis Quick-Scoring Mental Ability Test (Otis Q-S), and seven of the eight Differential Aptitude Tests (DAT). The seven tests from the DAT were Verbal Reasoning (VR), Numerical Ability (NA), Abstract Reasoning (AR), Space Relations (SR), Mechanical Reasoning (MR), Clerical Speed and Accuracy (CSA), and Spelling (Spell.). While the abilities which five of the above tests measure are clear from their names (VR, NA, AR, MR, and Spell.), it should be noted that the MPFB, SR, CSA, and Otis Q-S tests measure two-dimensional spatial ability, three-dimensional spatial ability, perceptual speed, and general mental ability respectively.

The administration and scoring procedures set forth in the Manuals (1, 5, 6) for each of the tests were carefully observed.

2. *Subjects and Procedure*

The subjects, 125 men and 229 women, were undergraduate students from psychology classes at Hunter College.

All subjects, tested in groups in their respective classrooms, were given the anagram test and one or more of the aptitude tests. The number of aptitude tests administered to any one class was dependent upon both the amount of time the class was available for testing, and the time required to administer each test. The procedure of using a number of groups in this way was made necessary because of the unavailability of a sufficiently large single group of subjects to take all 10 tests. Nevertheless, because the student population from which the subjects were chosen is relatively homogeneous with respect to scholastic aptitude, it is possible to consider the different classes of subjects tested in the present study as roughly equivalent to one another in intellectual ability.

C. Results and Discussion

The product-moment correlations between the anagram test and each of the nine tests of mental ability are presented in Table 1.

The results reveal that seven of the tests correlated positively and significantly with anagram solving. The seven tests were VR, NA, AR, SR, Spell., MPFB, and the Otis Q-S. The remaining two tests, MR and CSA yielded *r*s that were essentially zero. Except for the Otis Q-S and Spell. tests, which are not tests of primary ability, the strongest relationships occurred between anagram solving and the nonverbal measures. Verbal reasoning (VR), on the other hand, was only slightly related to the solution of anagrams, the correlation between the two representing the lowest measure of association obtained in the study.

TABLE 1
Pearson Correlations Between the Anagram Test and Each of the Nine Aptitude Tests

Aptitude Test	*N*	*r*	*p*
DAT, Verbal Reasoning	83	.22	<.05
DAT, Numerical Ability	61	.37	<.01
DAT, Abstract Reasoning	51	.41	<.01
DAT, Space Relations	58	.28	<.05
DAT, Mechanical Reasoning	58	.04	NS
DAT, Clerical Speed and Accuracy	54	—.03	NS
DAT, Spelling	49	.45	<.01
MPFB	88	.33	<.01
Otis Q-S	58	.49	<.001

The findings, therefore, demonstrate that anagram solving is clearly related to general mental ability and spelling achievement. In addition, it is also significantly and positively related to the aptitudes for dealing with (*a*) verbal concepts, (*b*) numerical relationships, (*c*) nonverbal abstractions, (*d*) two-dimensional space relations, and (*e*) three-dimensional space relations. The relative strength of these relationships, moreover, suggests that the ability to solve anagrams may be more closely associated with nonverbal than with verbal skills, although this suggestion should be considered somewhat cautiously, since all of the correlations were not obtained with the same group of subjects.

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TWO SCALES TO MEASURE ACHIEVEMENT MOTIVATION*[1]

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A. Introduction

Achievement motivation has most often been measured through the scoring of fantasy elicited in story form by TAT and TAT-like stimuli (1, 2, 3, 4). A recent review of the evidence (9) casts doubt on the position that fantasy n-Ach provides a reflection of a regnant achievement motive.

Self-report measures of achievement motivation are available, but are embodied in questionnaires measuring a variety of personality traits [e.g. (7)]. Since research workers often only require scores on an achievement motivation scale, a less time-consuming method of obtaining such scores seemed to be needed. The results of the study to be reported suggest that for reasons other than the saving of time the scales may be of value to researchers.

B. Study I

1. *Method*

An inventory containing 100 items to be answered "Yes" or "No" was prepared for administration to *S*s. No item from any other published personality scale was included although a number of items in the 100 item scale were based on items from the EPPS.

The inventory was administered to 191 men and 191 women in groups ranging in size from 10 to 115 *S*s. The ages of these *S*s ranged from 17 to 59 years. A variety of occupations was represented—college students, nurses, psychiatrists, firemen, and theological students.

The 100 items of the inventory were intercorrelated by means of phi coefficients. Unities were placed in the diagonals of the correlation matrix. Ten factors were extracted from the original correlation matrix by the principal axis method and the factors were rotated to orthogonal simple structure using Kaiser's normalized varimax criterion. It had been decided prior to the study to stop factoring after the extraction of 10 factors, since it was unlikely that more than 10 significant factors would be found.

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2. *Results*

The first two factors accounted for 24 per cent of the total variance. None of the other factors accounted for more than 2 per cent of the total variance. For each of these factors, following the method of Bendig (5), the squared factor loading of each item was multiplied by the variance of the item to derive absolute measures of the amount of factor variance contributed by the item. The 14 items with the largest variances attributable to the first factor and with the smallest variances attributable to the second factor were selected, and the 20 items with the largest variances on the second factor and smallest variances on the first factor were selected.

An obvious problem with the scales at this stage in their development was their imbalance in terms of the direction of the keyed responses. For the scale of 14 items, 13 were keyed in the "No" direction. For the scale of 20 items, 18 were keyed in the "Yes" direction. The second study was designed to produce balanced scales.

C. STUDY II

1. *Method*

Some of the items of both scales were reworded so that half of the items in each scale was keyed in the "No" direction and half in the "Yes" direction. The scales were administered to 200 additional college students—100 men and 100 women. The 34 items of the two scales combined were intercorrelated using phi coefficients, and a factor analysis was performed. The factor analysis procedure followed was the same as that in Study I apart from the fact that only two factors were extracted and rotated.

2. *Results*

Ten of the 34 items either had factor loadings on the two first factors that were too low or had high factor loadings on both of the two factors. The final Scale I consists of 10 items and the final Scale II of 14 items. The items with their loadings on Factors I and II are given in Table 1.

Examination of the content of the items suggests that Scale I is measuring the motivational dispositions of the individual who wants to do a job well, whereas Scale II measures the dispositions of the person who desires to be a success. The real nature of the traits being measured by the scales can be determined only by further validation studies. Only one small study of this nature has been completed.

TABLE 1

ITEM CONTENT AND FACTOR LOADINGS FOR ACHIEVEMENT SCALES I AND II

Item No. and content	Factor Loading	
	Factor I	Factor II
Scale I		
1. Are you inclined to read of the successes of others rather than do the work of making yourself a success?	.56	—.13
2.* Would you describe yourself as an ambitious person?	.43	.08
3.* Do you work for success rather than daydream about it?	.60	.06
4. Would you describe yourself as being lazy?	.62	.02
5.* Do you usually work to do more than just get through an examination?	.49	.23
6. Will days often go by without your having done a thing?	.40	—.09
7.* Do you do things "today" rather than putting them off to do "tomorrow"?	.56	—.11
8. Are you inclined to take life as it comes without much planning?	.43	.21
9.* Do you work hard at a job?	.58	.17
10. Do you, or did you, do little preparation for examinations?	.51	.07
Scale II		
1.* Do you grow excited when telling someone about the work you are doing?	.04	.37
2. Do you usually remain free from boredom when on holiday?	—.06	.35
3.* Are you very interested in the lives of successful people?	—.17	.40
4. Do you remain relaxed at the thought of a difficult task you are about to undertake?	.11	.51
5. Are you usually unimpressed by how hard others work?	.02	.35
6. Are you usually able to sleep even when engaged in an exciting job?	—.01	.36
7.* Are you usually awed in the presence of very successful people?	—.05	.46
8. Can you usually concentrate on what people are saying to you even when an important job is unfinished?	.02	.32
9.* Does the great achievement of others sometimes make you feel small?	.00	.55
10.* Have you at any time tried to model your life on that of a successful person?	.05	.39
11. Do you readily forget your work when you are on holiday?	.11	.36
12.* Are you influenced by those around you in the amount of work you do?	—.11	.39

TABLE 1 (*continued*)

Item No. and content	Factor Loading Factor I	 Factor II
13. Do you usually remain free from envy when others are successful?	.06	.61
14.* Do you often compare how well you can do something with how well others can do it?	—.13	.47

* Item scored for "Yes" response. Other items scored for "No" response.

D. STUDY III

1. *Method*

Achievement Scales I and II were administered to a new sample of 264 college students—132 men and 132 women—along with the Taylor Manifest Anxiety Scale (10), the Maudsley Personality Inventory (8) and Brengelmann's Drive Scale (6). The split-half reliabilities of the achievement scales and their correlations with one another and with the other personality scales administered were obtained.

2. *Results*

The split-half reliability for Scale I was .82 and for Scale II .73. The intercorrelation of the two scales was —.17. The Pearsonian correlations between scores on Scales I and II and the four other personality scales administered to *S*s are shown in Table 2.

TABLE 2
PEARSONIAN CORRELATIONS BETWEEN SCORES ON SCALES I AND II AND SCORES ON FOUR OTHER PERSONALITY SCALES

Scale	Taylor MAS	MPI-N	MPI-E	Brengelmann Drive Scale
Scale I	—.33	—.30	.01	.20
Scale II	.66	.57	—.07	.18

E. DISCUSSION

It had been anticipated that factor analysis would produce one factor of achievement motivation; instead two factors have been obtained. Further factor analytic studies are required to establish both the stability and validity of these factors.

The item content of the scales suggest that Scale I measures disposition to do well when performing a task. Scale II appears to measure a need to be a success. Scores on Scale II were significantly related to scores on scales measuring neuroticism and manifest anxiety.

F. SUMMARY

A factor analytic study of 100 self-report items designed to measure achievement motivation resulted in two main factors. The same two factors were obtained in a second factor analysis after some items were reworded to avoid the effects of acquiescence response sets. Two new scales of achievement were developed. Scale I appears to measure a need to do well at a task. Scale II appears to measure a need to be a success and was significantly related to scores on scales of anxiety and neuroticism.

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INHIBITORY TRAINING OF DOGS: EFFECTS OF AGE AT TRAINING IN BASENJIS AND SHETLAND SHEEPDOGS*[1]

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A. INTRODUCTION

This report is concerned with the genesis of the "kennel dog syndrome." If dogs are kept in kennels for long periods with no training other than that incidental to provision of physical care, they become virtually untrainable. If such animals are removed from the kennel at 4 months of age or later, they frequently become unsatisfactory pets, difficult to housebreak, and timid with strangers. On the other hand, if puppies are reared under laboratory-kennel conditions but are given adequate socialization experience with human handlers they are easily trainable and react normally (4).

In the course of experiments on the effects of genetic background and the development of social behavior in puppies, it was found that there might be a critical period for learning between 8 and 12 weeks of age. Puppies that had received preliminary training with retrieving objects at an early age performed much better at 40 weeks of age than those animals without previous training. Experiments performed at *Guide Dogs for the Blind* (where animals are given training once per week from 8 to 12 weeks and then placed in 4-H homes at 12 weeks) indicated that these animals performed well in later Guide Dog training at one year of age. If the dogs were kept in the kennels for two or more weeks beyond the normal period and given no additional training, they did not perform as well (3).

These observations have at least three possible theoretical explanations, no one of which necessarily excludes the others. The first of these explanations is that the kennel dogs are deprived of socialization experiences with human handlers during the critical period of socialization from approximately 3 to 12 weeks of age. This lack of experience would make them fearful of human handlers and would make it difficult for the dogs to develop a positive

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motivation for the handling reinforcement or reward associated with training. The second explanation is that these animals lack experience with anything outside of their limited kennel conditions. Fuller and Clark (1, 2) have shown that puppies, reared in tactual and visual isolation from other dogs and people from 3 weeks onward, will develop normally if removed from isolation as late as 7 weeks of age. If left in isolation as long as 16 weeks, the dogs will show grossly disturbed behavior and a lack of trainability. This "isolation syndrome" appears to be a more extreme form of the kennel dog syndrome, and may be explained on the basis of an emotional trauma when removed from the isolation cage and exposed to the outside world. This unpleasant emotional reaction may become generalized to all situations that are different from their familiar cages. A third possible explanation is that during the long period with no training and in restricted environmental conditions, the dog may develop a *negative learning set*. This negative learning set may be derived from two conditions. One is related to the dog's acquiring certain perceptual and motor patterns that are not compatible with later training, while the second condition is related to the psychological "atrophy" of certain perceptual and motor patterns that prevent the dog from acquiring information and skills. In the former case, the absence of specific training has permitted the dog to develop response patterns adaptive to its specific environment that compete with the learning of new response patterns. In the latter case, the lack of specific experiences has resulted in a deficit condition upon which it is difficult to superimpose new learning experiences.

The first two of these theories are based on the acquisition of emotional reactions, one associated with human handlers, the other with the physical environment, that interfere with the respective processes of forming emotional attachments with these two kinds of objects. The third theory is a purely cognitive one. As indicated above, these theories may represent factors with additive or interactive effects.

The present experiment is an attempt to investigate the cognitive theory of negative learning sets by controlling for the effects of environmental factors and human handling. The experiment was designed so that all animals were reared under standard laboratory kennel conditions from birth until 18 weeks of age. All training was done within the home nursery room so that physical surroundings were held constant. All puppies were given the same amount of handling and human social contact at all ages when training took place. The principal variable in the experiment was, therefore, the time of initial training, at 4 to 6, 8 to 10, and 16 to 18 weeks of age. It was expected that if an optimum period for new training exists, it should be at 8 to 10 weeks of age and that the performance of animals trained earlier and later than this time would be inferior.

In addition, the experiment provided an opportunity for measuring the retention of previous training, since all groups of animals were tested at 16 to 18 weeks of age.

The task chosen was one involving inhibitory training. Previous experiments at this laboratory (4) had largely avoided this kind of training, which is, at least hypothetically, strongly involved in the genesis of maladaptive behavior. It is, however, also a kind of training that has great importance in practical dog training, since different breeds appear to have been selected for greater and lesser capacities for inhibiting behavior. For this reason, two different breeds were selected for subjects.

B. METHOD

1. *Subjects*

*S*s were purebred dogs from the colony maintained at Hamilton Station of The Jackson Laboratory. Sixteen male African basenjis from seven litters and 16 Shetland sheepdogs (nine male and seven female) from five litters were used. All pups except for four basenjis were reared with their mothers until weaned at 10 weeks of age. These four basenjis were weaned at 4 weeks of age and reared as a group because they came from litters with one or two pups. Conditions of housing, maintenance, and health care were similar to those of all dogs reared in our colony and have been previously described (4).

2. *Apparatus*

The inhibitory training task required the dog to remain on a gray plywood board (40 × 40 × .5 inch) placed in the middle of the home pen. The floor of the pen surrounding the board was covered with shavings, so that the footing provided a definite cue when a pup stepped off the board. A choke collar, which was connected to a rope and pulley system, enabled *E* to correct the dog's responses by pulling him back onto the board from outside the pen. Because of the increased size of the dogs at 16 weeks of age, the test board was moved from the center of the pen to a wall and a heavier choke collar and pulley equipment were used. A schematic diagram of the apparatus is presented in Figure 1.

3. *Procedure*

At 4 weeks of age, pups were assigned to each of four training groups, so that as far as possible each group represented a maximum number of litters.

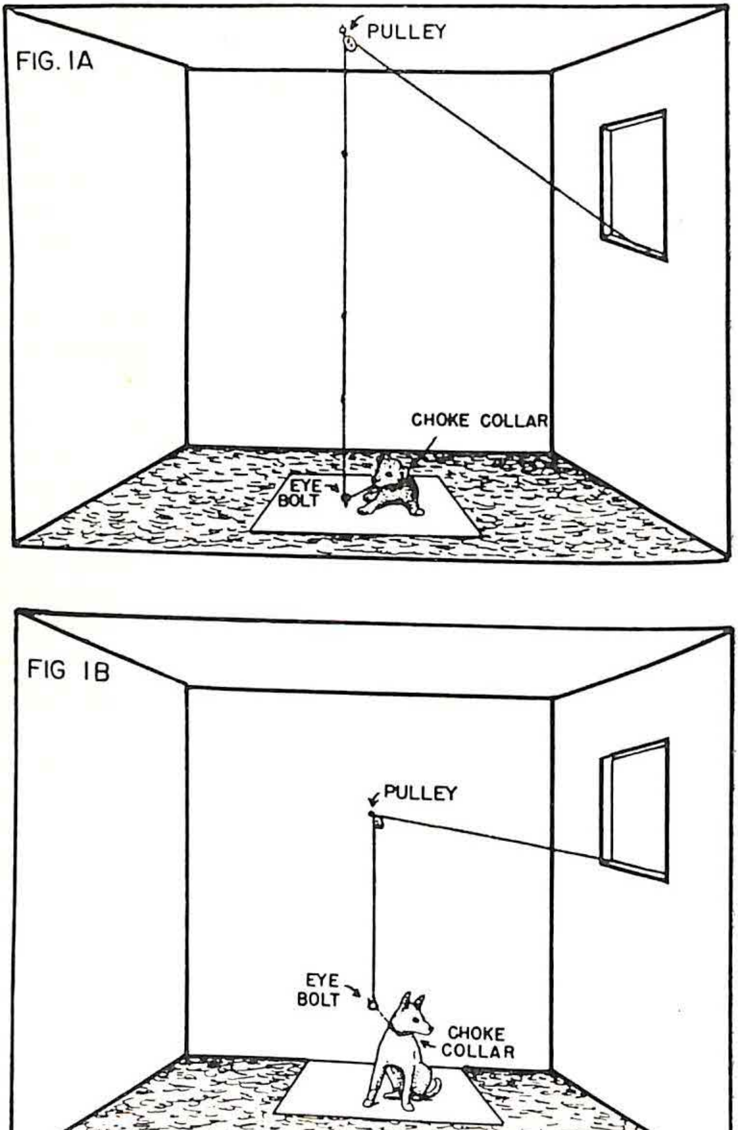

FIGURE 1
Diagram of Inhibitory Training Apparatus Used at 4 to 6 and 8 to 10 Weeks (1A) and at 16 to 18 Weeks (1B)

There were four pups in each group. The four training groups were as follows: Group I received inhibitory training at 4 to 6, 8 to 10, and 16 to 18 weeks; Group II at 4 to 6 and 16 to 18 weeks; Group III at 8 to 10 and 16 to 18 weeks; and Group IV at 16 to 18 weeks only.

Tests were conducted Monday through Friday during two successive weeks at the ages specified. Prior to the test of each day, the dogs were removed from their home pens and placed in holding cages while the apparatus was set up. For each trial, the dog was carried from the holding cage and placed on the board in its home pen. The choke collar was then attached. If the dog had moved, he was replaced at the center of the board and the collar tugged gently. *E* then left the pen, which started the time for the trial. If the dog placed two of his feet off the board, he was corrected by being pulled back. This started the time to criterion over again. The trial terminated when the dog either achieved the time criterion for staying on the board or received five corrections. At the termination of the trial, *E* carried the dog back to the holding cage, and after several minutes another dog was selected. For each trial, *E* recorded the number of corrections required, total time of staying on the board, and the longest single duration of staying on the board. A dog that was not being tested during a given two-week period received similar handling during each trial by *E*'s carrying him for a similar distance down the hallway, placing him on the floor for a few seconds, picking him up, and returning him to the holding cage. The order of trials was rotated each day.

The test was designed so that a standardized regime could be followed which would still permit a good learning situation. Essentially, the puppy was required to learn a passive avoidance task reinforced by mild punishment or reward. Failure (going off the board) was punished by immediate pulling on the choke collar, and success was rewarded by immediate removal from the situation. Success on a short criterion was required before the animal could proceed to more difficult trials, and the criterion on the last trial on any day was made equal to that of the preceding successful trial, in order to ensure that the last trial of the day would ordinarily be successful.

Details of the training procedure were as follows:

a. Day 1. Each dog received a preliminary trial which consisted of being held in position on the board by the rope and collar for a five-second period.

b. Day 2. Each dog received a preliminary trial as described, and two training trials. Each training trial was run until the dog stayed on the board for 15 consecutive seconds or received five corrections. A trial was scored as "perfect" if *S* attained the time criterion of 15 consecutive seconds and required no more than one correction.

c. Day 3. Each dog received a preliminary trial and five training trials. On the first training trial, the time criterion was 15 seconds. If this trial was not a perfect trial (two or more corrections), the time criterion for Trial 2 was 15 seconds again. If Trial 1 was a perfect trial, then five additional seconds were added to the 15 seconds, thus making the criterion 20 seconds on Trial 2. With each successive perfect trial, an additional five seconds were added to the previous time criterion. The following exceptions were noted. If *S* met the time criterion but not the correction criterion for a perfect trial, he proceeded to the next trial at the same time criterion level as before. If this was a perfect trial, he proceeded as previously described. If this was not a perfect trial, then the time criterion was reduced to the next lower time criterion. If the dog failed the criterion set, on the subsequent trial the time criterion was reduced to the next lowest time criterion. On Trial 5, the time criterion was always the same as the highest level previously passed. If the dog succeeded in passing all trials, examples of the successive time criteria would be 15, 20, 25, 30, and 30 seconds for the five trials on Day 3.

d. Day 4. This day's test schedule was the same as Day 3 with a preliminary trial and five training trials. On the fourth through the 10th day of testing, if the dog met the highest time criterion he could have met on the previous day, five seconds were added to the previous standard time raise. The time criterion on Trial 1 was 15 seconds, and if the dog proceeded with a perfect trial and had met the highest time criterion he could have met, 10 additional seconds were added to the base level of 15. The same considerations as stated above were still in operation. Thus, the successive time criterion could have been 15, 25, 35, 45, and 45 seconds, respectively, for the five trials.

e. Day 5. This day was the same as Day 4 except that 15 seconds were now added to each successive perfect time score if the animal had met the highest possible time criterion (45 seconds) on Day 4. Thus, the possible time criterion employed could have been 15, 30, 45, 60, and 60 seconds, respectively.

f. Days 6 through 10. These days were run the same as previously described except that either 20, 25, 30, 35, or 40 seconds could be added to the time criterion of each day for perfect performance if the animal met each day's highest possible time criterion. On Day 10 of this series, dogs performing at the maximum level received extra trials with the time criterion imposed of 1.5, 2, 3, 4, 5, etc., times their previous longest time criterion. This was restricted to a maximum limit of 10 minutes or five extra trials.

g. Days 6 through 10 (test period 16 to 18 weeks). Because of greatly enhanced performance at this age, the pups were given opportunities to reach criteria beyond those previously given. Day 6 of this period was treated as

Day 10 as previously described with extra trials and increasing time criteria limits. On subsequent days, extra trials were given with increasing time criterion requirements of .5, 1, 2, 3, and 4 times the longest performance of the previous day. For any given day, no more than five extra trials were run and these were discontinued if the dog required a single correction or if the time exceeded 10 minutes. The maximum time criterion was 10 minutes. If a dog achieved this prior to the last day, one 10-minute trial was given each day following the regular series of five trials.

C. Results

1. *Adequacy of Training Procedure*

If the training procedure was well designed, and all animals gave optimal performance, all dogs should give their best performance on the last day of training, or Day 10. Table 1 shows that in general this expectation is borne out. This table combines the data of both breeds and across treatment groups. There is some difference associated with age of training, the best results being obtained at 8 to 10 weeks and the poorest at 4 to 6 weeks. Further, all the exceptional animals (those that performed best at some other day than Day 10) at 16 to 18 weeks came from Groups I and II and thus had previously trained at 4 to 6 weeks. Thus there is some indication that there is a carryover of undesirable habits from training at too early an age, but the figures are not statistically significant with these numbers. The results with the two breeds were almost identical.

TABLE 1

Number of Dogs Showing Best Performance on Final (Day 10) Day of Training at Any Age Regardless of Breed or Treatment Group

	Age of training (weeks)		
Day	4-6	8-10	16-18
10	11	15	26
Other	5	1	6
Total	16	16	32

2. *Modes of Adjustment*

The most effective response to training was for the puppy to sit or lie quietly on the board and wait until he was removed. Some of the most successful Shetland sheepdog puppies did this. Other puppies spent most of the time chewing on the chain of the choke collar or wandering around on the board. The last response was most likely to result in stepping off the board and receiving punishment.

3. *Age of Initial Training*

Effects of age of initial training were evaluated by comparing the scores of the four treatment groups on two performance measures of inhibitory training: total time in minutes spent on the board during the best performances (longest time without corrections) over all trials for nine days; and total corrections over all trials for nine days. Ordinarily, these two measures should be negatively correlated. For this analysis, Groups I and II were combined, both having initial training at 4 to 6 weeks.

Figure 2 shows the total time for the best performances for the two breeds of dogs at different ages of initial training. Analysis of variance of these data demonstrated significant effects of breed ($F = 4.92$, $df = 1/26$, $p < .05$), age of treatment ($F = 7.37$, $df = 2/26$, $p < .01$), and a breed × age of treatment interaction ($F = 7.08$, $df = 2/26$, $p < .01$). Detailed examination of the data shows a significant age of treatment effect in basenjis when the two groups first tested at the older ages are compared with those first tested at 4 to 6 weeks. In Shetland sheepdogs, there is only one significant difference, that between the 16 to 18 week group and the rest. Thus there is an upward shift in trainability in basenjis between 4 and 8 weeks, and a considerably larger shift in Shetland sheepdogs between 8 and 16 weeks.

Figure 3 shows the total number of corrections for the two breeds of dogs at different ages of initial training. Analysis of variance of these data demonstrated significant effects of breed ($F = 5.82$, $df = 1/26$, $p < .05$) and age of treatment ($F = 5.68$, $df = 2/26$, $p < .01$), with no significant interaction between the two ($F = 1.01$, $df = 2/26$, $p =$ N.S.). Shetland sheepdogs required consistently less corrections than basenjis, and in both breeds the older the animal at the start of initial training the less corrections were required. The breed difference in the time of increasing trainability is also reflected in these data.

4. *Previous Training*

Effects of previous training were assayed by comparing the performance of all groups at 16 to 18 weeks. Group I had two previous training sessions, Groups II and III had one each at different times, and Group IV had no previous experience.

Figure 4 summarizes the data of the total time for the best performances in the two breeds of dogs and four treatment groups. An analysis of variance

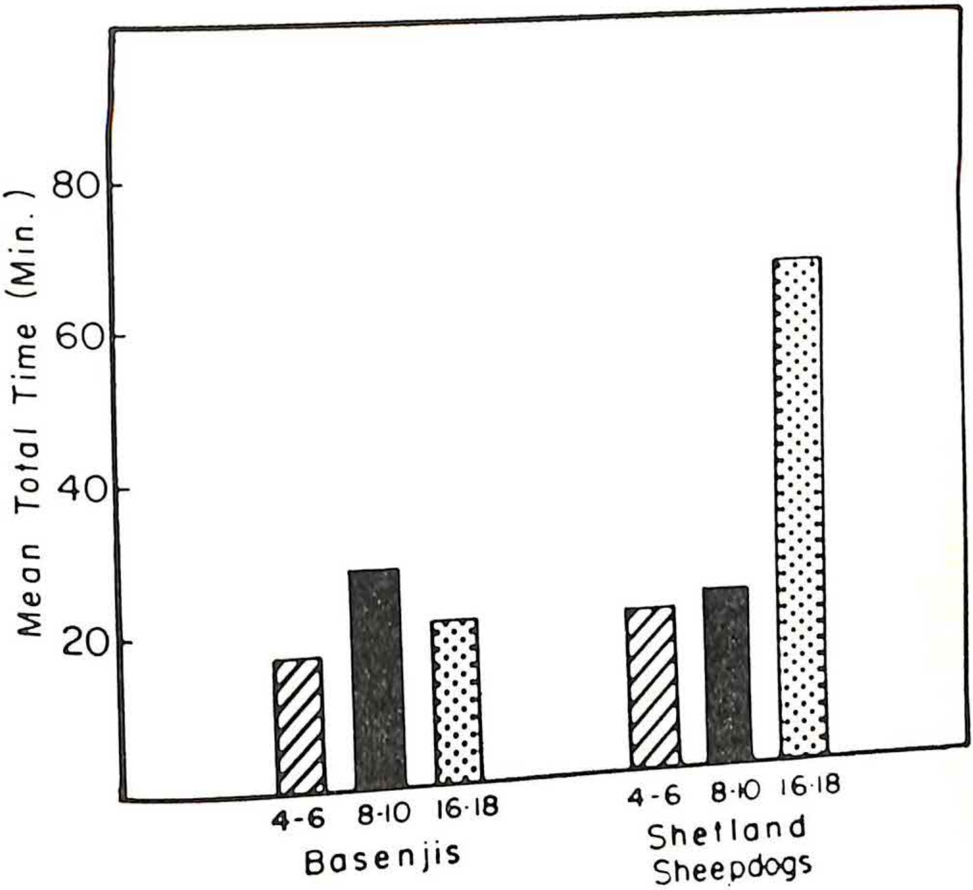

FIGURE 2
MEAN TOTAL TIME IN MINUTES FOR BEST PERFORMANCE OVER ALL TRIALS FOR NINE DAYS OF INITIAL TRAINING AT DIFFERENT AGES FOR BASENJIS AND SHETLAND SHEEPDOGS

again demonstrated that the Shetland sheepdogs were more inhibited than the basenjis ($F = 16.09$, $df = 1/24$, $p < .01$). However, there was no overall effect of prior training ($F = 1.47$, $df = 3/24$, $p =$ N.S.), nor was there an interaction between breed of dog and prior training ($F = 1.22$, $df = 3/24$, $p =$ N.S.). In both breeds, Group IV, the group that had no prior training, performed more poorly on the average. In order to determine the effect of previous training regardless of the amount, the scores of Groups I, II, and III were combined and compared statistically by means of a t test to Group IV. The difference is not statistically significant in either breed, and similar negative results were obtained with nonparametric tests. Thus, previous training had no important effects.

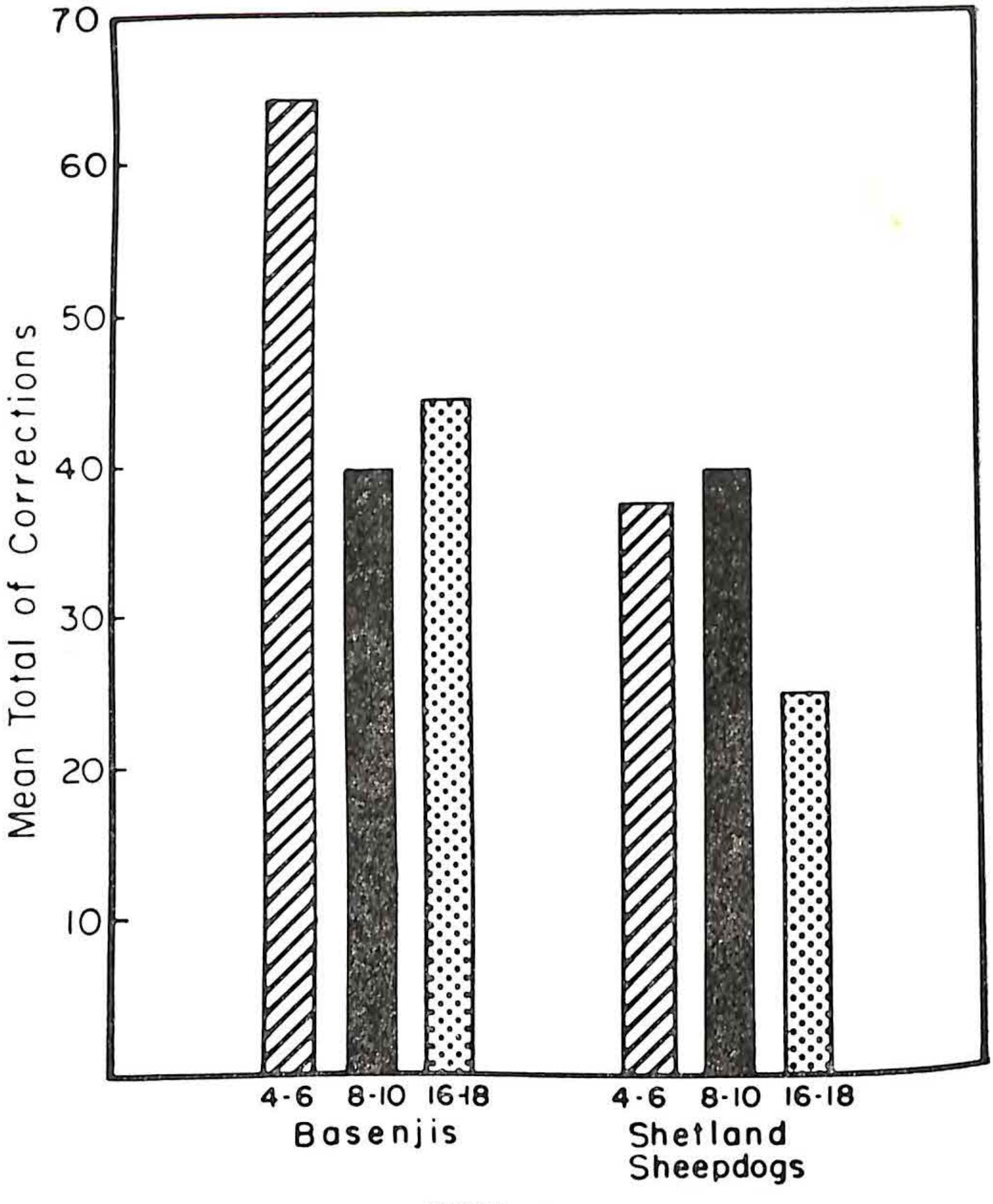

FIGURE 3
MEAN TOTAL OF CORRECTIONS OVER ALL TRIALS FOR NINE DAYS OF INITIAL TRAINING AT DIFFERENT AGES FOR BASENJIS AND SHETLAND SHEEPDOGS

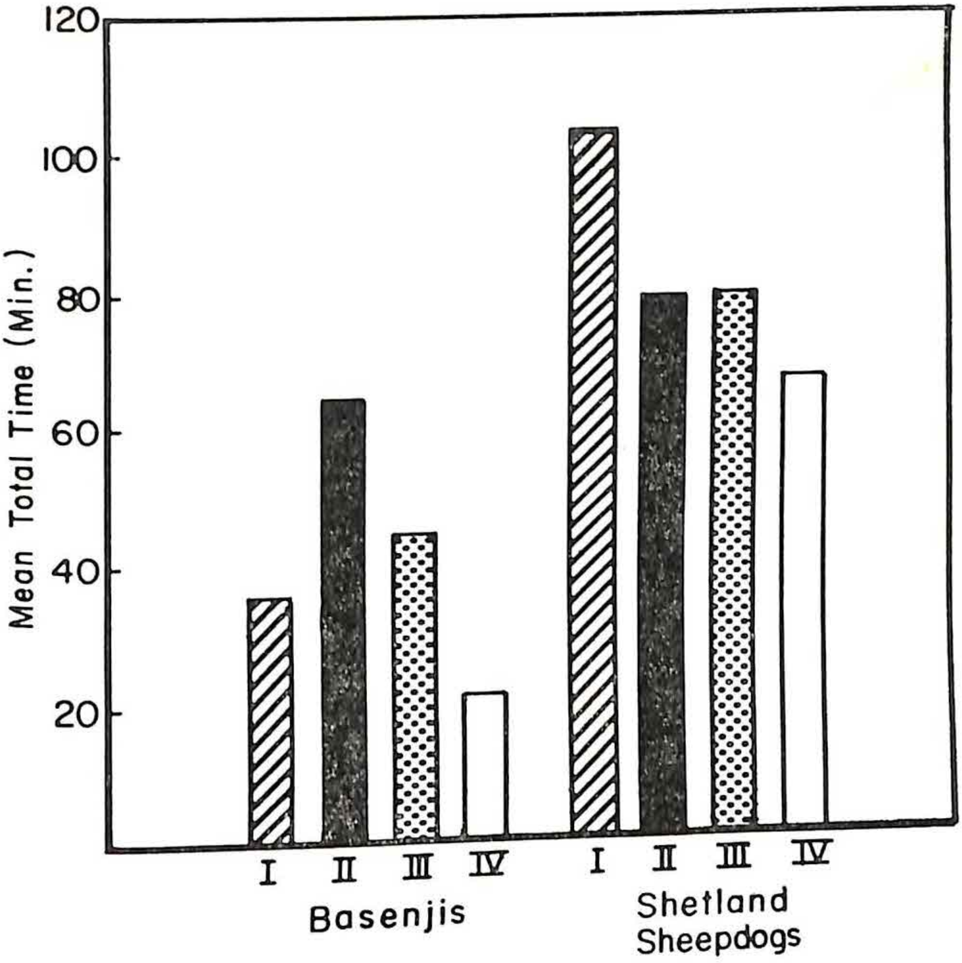

FIGURE 4
MEAN TOTAL TIME IN MINUTES FOR BEST PERFORMANCE OVER ALL TRIALS FOR NINE DAYS AT 16 TO 18 WEEK TEST FOR BASENJIS AND SHETLAND SHEEPDOGS RECEIVING TRAINING AT EARLIER AGES

Figure 5 shows the data of the total number of corrections for the two breeds of dogs and four treatment groups. Analysis of variance of these data shows that Shetland sheepdogs required significantly fewer corrections than basenjis ($F = 6.09$, $df = 1/24$, $p < .05$). Again, there was no overall effect of previous training ($F = 1.36$, $df = 3/24$, $p =$ N.S.), nor an interaction between breed of dog and previous training ($F = 0.05$, $df = 3/24$, $p =$ N.S.). The comparison of Groups I, II, and III with Group IV was made on the corrections scores in the same way as previously described. Again, the trend is

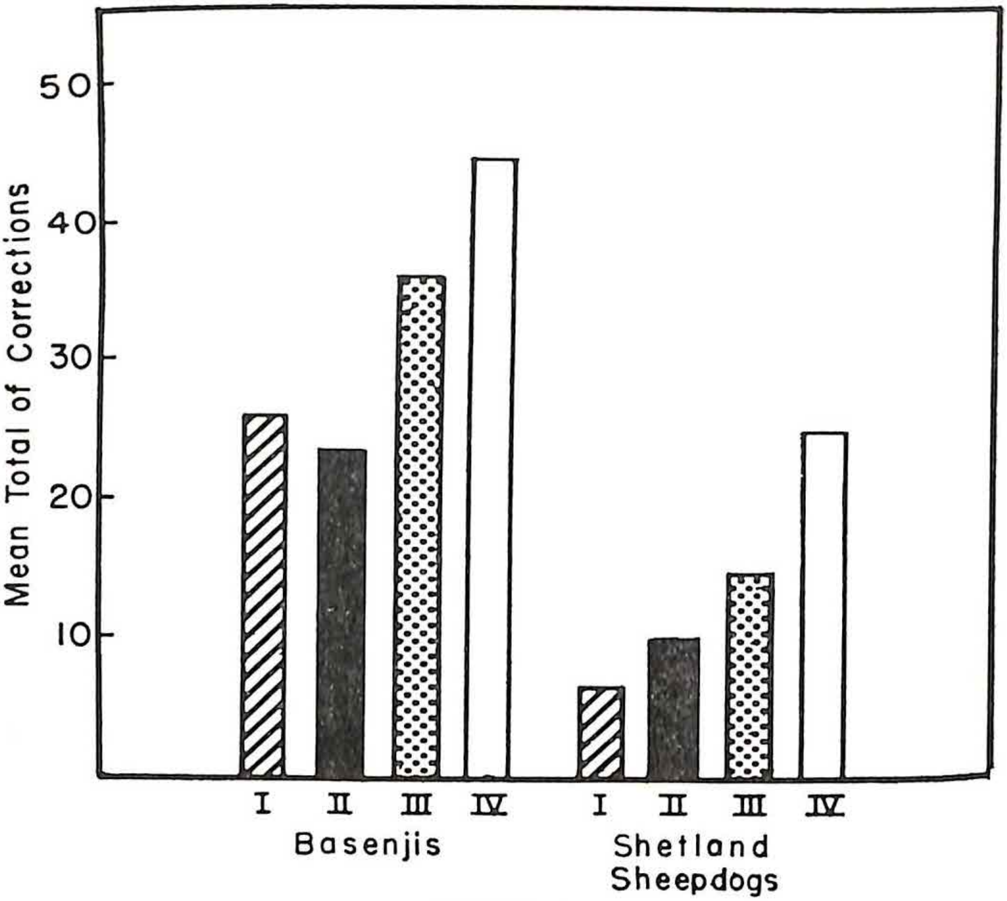

FIGURE 5
MEAN TOTAL OF CORRECTIONS OVER ALL TRIALS FOR NINE DAYS AT 16 TO 18 WEEK TEST FOR BASENJIS AND SHETLAND SHEEPDOGS RECEIVING TRAINING AT EARLIER AGES

not statistically significant in either breed, although somewhat greater in Shetland sheepdogs.

D. DISCUSSION

It is obvious from the above analysis that there are major breed differences in both measures of performance. Consequently, the analysis of variance chiefly emphasizes breed differences, and any meaningful discussion of other variables in the experiment must be done by considering each breed separately.

1. *Optimum Period for Training*

Figure 2 shows that the best performance in basenjis came at 8 to 10 weeks of age, as our original theory postulated, but the differences are too small to be significant with these numbers. From a statistical viewpoint, the data show only that basenjis perform equally well at the oldest two ages and more poorly at 4 to 6 weeks. In contrast, the performance of Shetland sheepdogs at the two earlier ages is approximately equal, but at the later age of testing, much superior. In the latter breed the number of corrections or punishments received by the animals is correlated inversely with their performance, the number of corrections being approximately equal at the first two ages and lower at the last. The basenjis show a corresponding picture, incurring the largest number of punishments at the earliest age and an approximately equal number at the last two ages.

In short, if there is an optimum period for initial training on this task, it is quite different in the two breeds, reaching a plateau in basenjis at 8 weeks and beyond, while performance in Shetland sheepdogs reaches a peak at 16 to 18 weeks and possibly beyond this age. None of these animals behaved like the untrainable kennel dogs, and we can conclude that the theory of negative learning sets explains only a small part, if any, of this phenomenon.

The question may be raised as to whether the improvement in Shetland sheepdogs at 16 to 18 weeks might not be the result of increasing the opportunity for performance at this age. Of the Shetland sheepdogs in Group III, none reached the criterion at 8 to 10 weeks that would have permitted extra trials at 16 to 18 weeks, whereas two of the four animals first tested at 16 to 18 weeks (Group IV) reached this criterion. The differences in performance at the two ages do not, therefore, result from the change in procedure.

2. *Optimum Time for Previous Training*

Group II, first trained at 4 to 6 weeks, and Group III, first trained at 8 to 10 weeks, are the critical groups for testing this point, as both have had the same amount of experience before the final testing at 16 to 18 weeks. Shetland sheepdogs of Groups II and III are almost exactly alike. This is consistent with their original performance. In other words, there is no indication that previous training at one time or the other has any different effect in this breed. In the basenjis, Group II, which had been first trained at 4 to 6 weeks, apparently shows a better performance than the group trained at 8 to 10 weeks, but this is not significant and may be accidental. Thus there is no evidence in favor of an optimal time for previous experience.

3. *Amount of Previous Experience*

As indicated above, there are no general effects of the amount of previous training. A more critical comparison is that between Group I, which has had two previous training periods, and Groups II and III, which have each had one previous period, but at the same times as Group I. In the Shetland sheepdog, Group I performed on the average better than Groups II and III, which were approximately equal. This conforms to the theory as expected, but results are not statistically significant. In basenjis, the Group I average is actually inferior to the other two, although again not statistically significant. We may conclude that while larger numbers might demonstrate that the amount of previous experience has an effect, it is certainly not a major one under these conditions.

4. *Breed Differences*

Clearcut breed differences on both measures of behavior were seen and represent differences in both the timing and amount of developmental change. The two breeds show quite different developmental pictures with respect to learning this particular inhibitory task. The basenjis are poor at 4 to 6 weeks and increase their performance by 43 per cent at the later ages. The Shetland sheepdogs stay at a low level, only slightly better than basenjis, at the first two ages and then improve by 212 per cent at 16 to 18 weeks. To make a more dramatic comparison, at 16 to 18 weeks of age, 11 out of 16 Shetland sheepdogs and only two out of 15 basenjis were trained to the highest criterion of remaining on the board for a full 10 minutes. At the same age, all of the Shetland sheepdogs were trained to the maximum criterion achievable without extra trials, while only seven of the basenjis were trained to this level.

The theory of negative learning sets or carryover from training at a time when performance is poor because of immaturity is not supported by these experiments. It follows that the lack of trainability seen in the kennel dog and isolation syndromes is probably largely produced by emotional factors arising from either lack of socialization to human handlers or lack of familiarization with the physical environment in which future training takes place, or both.

These conclusions apply only to this particular task of inhibitory training. The theory of negative learning sets might still be important with other tasks, and this experiment should be followed up with one involving positive training such as that in retrieving.

The major result here is that of confirming large breed differences in reaction to inhibitory training. There are many situations in which the capacity to accept inhibitory training is very important in a dog's existence, as this may determine whether or not an animal is an acceptable pet, and certainly will determine fitness for certain kinds of complicated training, such as that involved in learning to herd sheep. Although early experience may also produce major effects on behavior, as experiments with the isolation syndrome indicate, the kinds of experiential variables used in this experiment appear to be unimportant.

The results of this experiment raise the possibility that similar genetic differences in the ability to accept inhibitory training may exist in human children. There are, of course, well-established sex differences with respect to toilet training, and similar differences may well be important at later school ages. A large part of early school and kindergarten experience is devoted to training children to sit still, and this might offer a fertile field for the study of individual genetically determined differences, both between and within the sexes. The results of this training may have considerable effect on the child's future life in school, since for a teacher the good child is the one who sits still the longest.

This experiment may also have some relevance to the problem of the effects of restriction of the early environment on cognitive development in children. Our puppies were reared in what would ordinarily be considered a restricted and barren environment, but they responded to training quite effectively, with no indication that they were handicapped. The implication here is that the major effects of restriction are caused by emotional factors and that the damaging aspect of these is the result of being suddenly thrust into an unfamiliar environment.

E. Summary

This experiment was designed to analyze in part the factors producing the lack of trainability associated with the "kennel dog syndrome" and, in particular, to test the hypothesis of negative learning sets acquired independently of emotional factors. Sixteen basenji and 16 Shetland sheepdog puppies were each divided into four groups given initial training on an inhibitory task beginning at three different ages: 4 to 6, 8 to 10, or 16 to 18 weeks. All animals were given equal opportunities for socialization with human handlers and training took place in the home nursery room, so that behavior would not be modified by emotional factors resulting from contact with strangers or an unfamiliar physical environment. The training regime was organized in such a way that the amounts of training were equalized but maximum opportunity for improvement was possible. The results demonstrated clearcut breed differences in responsiveness to training, and that age of training was likewise an important factor. Age at previous training and amount of previous training had no significant effects on behavior at 16 to

18 weeks, indicating that negative learning sets were not acquired either as a result of training or lack of it. Thus the kennel dog and isolation syndromes must result either from a lack of socialization or a lack of familiarization with the future environment at this critical period, or a combination of the two.

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JAPANESE-AMERICAN CRIME AND DELINQUENCY*[1]

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A. Introduction

In an era of rising rates of crime and delinquency the Japanese population in the United States is remarkably atypical. Empirical data drawn from official sources show that their rates of crime are quite low, in spite of the fact that such negative environmental conditions as ghetto living, discrimination, and prejudice, often thought of as associated with criminal and delinquent behavior, have long been a part of the Japanese experience in the United States.

When we refer to low rates, the following figures are typical. Los Angeles County Probation figures (rates per 100,000) show that in 1930, Japanese adult rates were 53 compared to 190 for the non-Japanese; in 1940, Japanese rates were 149 compared to 518 for the non-Japanese; in 1950 Japanese rates were 111 compared to 589 for the non-Japanese; and in 1960 the Japanese rates were 67 compared to 793 for the non-Japanese. Juvenile figures from the same source show similar Japanese, non-Japanese differences: for example, in 1930, they were 300 to 1709; in 1940 they were 119 to 1069; in 1950 they were 180 compared to 1291; and in 1960 they were 450 to 1481.

Official figures from FBI statistics on arrests (7) indicate that the Japanese are the lowest among all comparison groups including the White, Negro, Chinese, and the Indian for 1940, 1950, and 1960. Other research studies show the same differences (1) (6).

Although all official statistics on crime and delinquency are subject to what Cressey calls the "funneling effect" (2) and all are open to biases in reporting, handling, arresting, sentencing, and the like, the consistency of the low Japanese position lends support to a generalization that they are a low official criminal and delinquent group.

The purpose of this paper is to offer possible explanations for this low delinquent culture by comparing delinquent and nondelinquent Japanese-Americans.

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B. METHODOLOGY

1. *Sample*

One of the difficulties in conducting research on Japanese crime and delinquency is the very small numbers of them who are held in official custody. Therefore, even if the study were designed otherwise, the research eventually results in a small sample study. The number of adult Japanese currently in California prisons (less than 10) precluded any systematic analysis of this population; the number of Japanese in California Youth Authority Camps (again less than 10) presented the same limitations.

The most available population was a group on probation from the Los Angeles County Probation Department ($N = 31$) and from the California Youth Authority ($N = 4$). This group of Japanese-American male probationers comprised our delinquent population.

We used a matched-sample strategy, whereby a group of nonprobationary Japanese, referred to as "normals," were chosen for comparison purposes. The normals were matched in terms of the same high school and, where possible, the same homeroom and the same grade as the delinquents. With the probationers who were already out of high school we matched high school seniors. We selected 37 Japanese normals to match closely the 35 delinquents. We were able to interview all 37 normal adolescents and their parents; we were able to interview 25 delinquents and their parents.[2]

The sampling procedure controlled for ethnicity, age, sex (all males), and social class, since there were no significant differences between the groups on these variables.

2. *Instrument*

The basic instrument used for the study was a guided interview schedule. The interviews were conducted by six social workers of Japanese ancestry. Pretraining sessions and the interview schedule were aids to reliability. The average length of the interview was two hours. In most instances the adolescent and his parent were interviewed in separate sessions.

A psychological test, the California Psychological Inventory (CPI), was also administered to the delinquent and the normal samples.

The results were analyzed in terms of chi square and Fisher's Exact Probability Test. All differences mentioned in the text are significant at the .05

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[2] From the probationer population the author encountered four refusals; two who were never in after appointments were made; two who were not currently residing in the local area; and two who had been recommitted. Therefore our delinquent $N = 25$.

level; all items in the tables reaching the same level of significance are underscored.

C. RESULTS

The results are presented in terms of two hypotheses.

1. *Hypothesis I*

The Japanese delinquent and his family are different from Japanese normals.

a. Structure of the home. The overall general rate of divorced or separated homes in the Japanese population is small. U.S. census figures for 1960 show that broken homes make up only 1.3 per cent of the Japanese population. This figure does not change by generation, since estimated divorce rates remain constant at 1.3 per cent for successive generations.

There were no separated or divorced homes among the Japanese normals in the sample, while 32 per cent of the Japanese delinquent homes of the sample were broken.

b. Adolescent attitudes toward the home. Attitudes of the normals and delinquents toward their homes is shown in Table 1. In the area of independence-dependence, the delinquents indicated a higher desire to leave home and to become independent than did the normals.

In the area of family relationships, *all* of the items were in the predicted direction. The normals consistently perceived their family in "good terms"—good relationships, reliance on verbal punishment, high obedience, and helpful parents.

The upward mobility of the normals is shown by the fact that 69 per cent of them wished that their "fathers had a better job" as compared to 28 per cent of the delinquents. This item could be interpreted in terms of possible home dissatisfaction among the normal sample.

Several overall generalizations can be inferred from the data. Both normals and delinquents generally agreed that they had good parents; that they received verbal discipline; that parents were helpful in money problems; and that the best method of obtaining cooperation was *simply to ask* (although most parents told us that simple asking never really got much action!). It is also interesting to note that both samples generally agreed that they did not obey their parents most of the time; that parents were not helpful in religious or girl friend problems; and that father was usually unavailable for discussions.

c. Responses between parents of normals and parents of delinquents. Responses of the parents of the two samples are shown on Table 2. Generally the parents of the delinquents answered in the more "unhappy" and "unhealthy" direction. For example, 84 per cent of the parents of the delinquents felt that the unhappiness of their own upbringing lead them to try to raise their own children differently; they spent less time with their children than did the parents of the normals; they disagreed with their wives on the handling of their sons and on family decisions; and generally tried to invoke sanctions on their children; but were much less effective than were the parents of the normal sample.

TABLE 1
ATTITUDES TOWARD HOME

Variables	Per cent "Yes" response Normals $N = 37$	 Delinquents $N = 25$
A. Independence-dependence		
1. Want to leave home as soon as possible	9	38
2. Wish to become independent of home	3	33
B. Family relationships		
1. Good father	97	76
2. Good mother	97	96
3. Good relationship with sibs	80	54
4. Compared to other parents, my parents get angry more often	14	40
5. Verbal discipline from father	81	40
6. Verbal discipline from mother	84	72
7. Obeys father most of the time	44	21
8. Obeys mother most of the time	41	13
9. Wishes parents would at least ask if they want cooperation	88	83
10. Parents helpful in money problems	100	92
11. Parents helpful in religious problems	40	28
12. Parents helpful in girl friend problems	47	45
13. Parents helpful in school problems	58	27
14. Parents helpful in sex and growing up problems	69	20
15. Father available for discussion	26	36
16. Mother available for discussion	46	63
C. Desire for change		
1. Wish father had a "better job"	69	28

There were areas of agreement between the parents of the two groups: for example, both samples generally agreed that their own upbringing was severe (overly strict Issei parents, poverty, lack of opportunity); and both groups were generally relaxed about permitting some freedom in drinking, about setting time limits on when to come home, and about keeping tab on the whereabouts of their sons. The upbringing of girls, however, tends to be more strict than that of boys.

TABLE 2
PARENTAL RESPONSES

Variables	Per cent "Yes" response Parents of normals $N = 37$	 Parents of delinquents $N = 25$
A. Own upbringing		
1. Severity of own childhood	62	60
2. Abnormality of own childhood	27	57
B. Parent-son relationships		
1. Bringing up son differently from own childhood	43	84
2. Spend much time with son	36	11
3. Do things together with son	94	63
C. Parental agreement		
1. Husband-wife agreement on handling son	94	47
2. Husband-wife agreement on family decisions	92	33
D. Sanctions and effectiveness of sanctions, parent-child		
1. a. Attempt to control smoking of son	20	55
b. Effectiveness of control	79	11
2. a. Attempt to control drinking of son	14	21
b. Effectiveness of control	97	80
3. a. Attempt to control hair style of son	35	6
b. Effectiveness of control	95	53
4. a. Attempt to set control of time	9	16
b. Effectiveness of control	97	81
5. a. Attempt to know where son goes	3	16
b. Effectiveness of control	97	62
6. a. Attempt to communicate with son on problems	9	21
b. Effectiveness of attempt	100	60
E. Parent-son communication		
1. Son only discusses problems when in trouble or seldom	37	61
2. Son enjoys parental discussions	77	40
3. Son accepts parental advice	53	30
4. Son accepts punishment well	40	8
5. Have you struck your son recently?	61	53
6. Son usually avoids household chores	19	32
7. Parent makes occupational choice for son	69	20

The parents of the normal sample did attempt to control the occupational choice of their children more than did the parents of the delinquent sample.

d. Differences in ethnic interaction. The normal adolescent sample was generally much more restrictive and ethnocentric than was the delinquent adolescent sample: for example, their clubs and their friends were primarily Japanese; they perceived that the friends of their parents were also mainly

Japanese; they disapproved of dating Mexican and Negro girls; they participated in Japanese activities, observed Japanese customs, and preferred Japanese meals. See Table 3.

TABLE 3
ETHNIC INTERACTION

Variables	Per cent "Yes" response	
	Normals $N = 37$	Delinquents $N = 25$
A. Ethnic composition of clubs and organizations		
1. Primarily Japanese	100	75
B. Ethnicity of friends		
1. Primarily Japanese	60	16
C. Perceived parental preference of friends		
1. Mostly Japanese	94	53
D. Perceived parental preference of parental friends		
1. Mostly Japanese	94	53
E. Feelings about dating girls of specific ethnic backgrounds		
1. Japanese girls	92	100
2. Other Oriental girls	68	72
3. Caucasian girls	65	68
4. Mexican girls	27	68
5. Negro girls	8	36
F. Degree of participation in ethnic activities		
1. General Japanese activities	62	32
2. Observance of Japanese customs at home	39	0
3. Preference for Japanese meals	69	32
4. Occupational involvement with Japanese community	14	0
5. Family identification with Japanese community	29	5
6. Considers self more Japanese than American	19	24
G. Parental attitudes on interethnic dating		
1. Parents approve dating Japanese girls	97	92
2. Parents approve dating other Orientals	49	72
3. Parents approve dating Caucasians	43	76
4. Parents approve dating Mexicans	5	60
5. Parents approve dating Negroes	3	36

Parental attitudes were also in the same direction. The normal parent sample preferred their sons to stay within their own group and disapproved of their sons' dating other Oriental, Caucasian, Mexican, or Negro girls.

d. Differences in perception toward the neighborhood and the schools. The delinquents were generally more dissatisfied with their neighborhoods and their schools (Table 4) than were the normals. They visited other areas; they felt that their parents disliked the neighborhood and they disliked the neighborhood more than did the normals. They also disliked school; their grades were poorer than those of the normals; they studied less; they were in more trouble; and few of their friends planned to go to college.

TABLE 4
THE NEIGHBORHOOD AND SCHOOL

Variables	Per cent "Yes" response Normals $N = 37$	 Delinquents $N = 25$
A. Adolescents' attitudes towards neighborhood		
1. Same residence in last 5 years	86	79
2. Most friends in same neighborhood	58	48
3. Visits other neighborhoods	43	86
4. Feels parents like neighborhood	97	53
5. Likes neighborhood	100	78
B. Adolescents' attitudes towards school		
6. Likes school	86	16
7. Grades in school above average or better	97	68
8. Study hard	86	32
9. Friends' grades in school above average or better	92	72
10. Been in trouble in school	35	88
11. College plans after high school	95	79
12. Friends plan to go to college after high school	81	16
13. Participation in school extracurricular activities		
a. Athletics	78	72
b. Social dances, rallies, etc.	84	83
c. Social clubs	35	28
d. Special interest activities (drama, music)	16	28
e. Student government	16	8
f. Honor groups	35	16
g. Minor offices	51	24

The parents of the delinquents also had similar perceptions (Table 5). They disliked their neighborhood; got along less well with their neighbors; and felt that their sons also got along less well in the neighborhood. They also perceived their sons as achieving poorly in school, as having less time set for homework; as receiving less encouragement for extracurricular participation (e.g., help from teachers, peers, and community people); and as possessing less of a chance to go to college. They also knew that their sons often cut school without a legitimate excuse.

A final question concerning an analysis of the future significantly differentiated the perceptions of the parents of the delinquent from those of the parents of the normal sample. Only 28 per cent of the normals foresaw some major problems in the future for their sons as compared to 84 per cent of the parents of the delinquents.

TABLE 5
THE COMMUNITY AND SCHOOL

Variables	Per cent "Yes" response Parents of nonprobationers $N = 37$	 Parents of probationers $N = 25$
A. Parents' attitudes towards neighborhood		
1. Like the neighborhood	97	74
2. Dislike specific things about neighborhood	54	88
3. Get along well with neighbors	78	37
4. Son gets along with neighbors	84	52
5. Son has had trouble getting along with others	14	47
B. Perception of son's attitudes towards school		
6. Son participates in school activities	89	60
7. Has time set aside for homework	100	60
8. Gets outside encouragement for extracurricular participation	73	44
9. Is satisfied with son's extracurricular activities	73	23
10. Wants son to finish high school or better	92	78
11. Can son go to college?	94	53
12. Does son cut school?	9	74

2. *Hypothesis II*

The personality of the Japanese delinquent is different from that of the Japanese normal.

The overall results of the California Psychological Inventory[3] indicate that the scores of the Japanese delinquents were similar to the scores of the California delinquents (normative group on the CPI) and the scores of the normals were similar to those of the normative high school population [see (3)].

Other interview items measuring self-concept of discrepancies in expectations and definitions of masculinity showed mixed results. The only items that significantly differentiated between the groups were (*a*) the answer that normals felt they were lucky and the delinquents that they were unlucky and (*b*) differences in describing self as a success.

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[3] Arrangement was made with a private psychologist to administer the CPI. Each respondent was paid a small sum of money to take the test and transportation was arranged. Therefore, the number of delinquents rose to 30; the investigators stopped at 30 for the normals.

Expectations and discrepancies were measured through the items "what I am," "what I wish I would be," and "what others think of me." There was close congruence among all of these perceptions.

When asked to describe the selves in terms of personality, 67 per cent of the delinquents said "average," as compared to only 23 per cent of the normals. When asked what it takes to be a man, 31 per cent of the normals said "one is just born that way," a response which got *no* backing from the delinquents. This difference might be indicative of the male role in the Japanese system, which requires less validation in terms of "acting out" or proving oneself as compared to the American definition.

D. DISCUSSION

The overall explanation of the differences between Japanese delinquents and nondelinquents relates to the concept of marginality. By marginality, we refer to both the sociological (e.g., individuals who do not belong to either the Japanese or the American middle-class society) and psychological (e.g., personality deviations).

The delinquents in the present study were the marginal population. They did not identify with their ethnic community; nor were they a part of their families, or their neighborhood, or the schools and other institutions. Their personality and self-perceptions also reflected this marginality. The broken home, high family conflict, minimal intercommunity interaction, and disturbed personality syndrome significantly differentiated the probationer from his nonprobationer peer.

Clinical impressions provided further validation for this point of view. Our interviewers often mentioned the apparent "non-Japaneseness" of the delinquent sample—especially in terms of talking (e.g., high use of lower-class argot); of dress (e.g., sloppy, extreme forms of apparel); and of physical appearance (e.g., hair style and general physical impact). Their social participation patterns were typically with non-Japanese lower-class populations. There is, of course, the question of whether the status of being a probationer has led to this marginality or whether this pattern was apparent before the probation role.

Basically, the marginal person does not identify with the major institutions of his culture and is, therefore, relatively immune to the social control influences of these forces. The problem is of identification, of socialization, of opportunities, and of reinforcement. Interestingly enough, the "marginal" population syndrome is also apparent among Japanese exhibiting other social problem behavior (4).

The important fact about the adaptation of the Japanese to life in the United States has been the ability of the ethnic system to provide a wide enough umbrella to control the development of a large "marginal group." There may be several reasons for this, including the essential congruence between American middle-class and Japanese styles of life. Therefore, initially, when interaction between the two systems was limited, the Japanese culture played a major socializing role. At the current time when the American system provides more ample opportunities than formerly, there is relative ease in moving over. It may be that other subcultures, less congruent with the American culture than is the Japanese subculture (e.g., possibly the Mexican-American) create special difficulties because integration into the ethnic or subgroup culture may mean a move away from the middle-class American culture and, therefore, eventual conflict when its members are faced with American institutions, such as the public schools.

Although many of the role prescriptions of the Japanese culture are congruent with middle-class America as represented by institutions, such as the public schools (e.g., values on hard work, conformity), an explanation of Japanese-American behavior must also stress the importance of its socializing and social control agents as represented by its intact and interdependent family and community. The ethnic school system, the ethnic economic and social welfare system, the ethnic voluntary and social opportunity systems served as strong shapers and reinforcers of ethnic values (5). It is precisely the development and maintenance of such a structure that apparently differentiates some of the more successful minority groups, such as the Jews and the Japanese, from the less successful minority groups, such as the Mexicans and Negroes.

Marginality and deviant behavior may also arise from both the content and a conflict among norms. Some hypothesized Japanese-American norms that may help to explain low rates of delinquent behavior include their emphasis on conformity, on collective behavior as against individualism, on high dependence on the community and family, on a high tolerance for frustration, on a strong work and achievement orientation, on internalization rather than "acting out," on high savings and delayed gratification, on less conflict over the masculine role, on a high value towards education, and on low expectations for participation in the American system. The Japanese culture also emphasized obligation, duty, and responsibility; provided for equal emphasis on means as well as ends; and in general provided for norms that may be associated with low delinquency (5).

Other possible explanations for the low rates of Japanese crime and delinquency may range from their immigration-emigration patterns which have led to a highly selected population (5), to a questioning of official criminal data that places undue emphasis on those who are caught.

It should also be emphasized that the "marginal" Japanese have many positive elements. They are less discriminatory (3), less conforming, and they may possibly exhibit more creativity and uniqueness than the normals.

E. SUMMARY

The research compared a group of Japanese delinquents and nondelinquents on a number of social psychological variables. Significant differences between the groups were found on individual, family, neighborhood, and community variables in the predicted direction. The results were interpreted in terms of marginality. The ability of the Japanese culture to provide alternative opportunities for its membership as a control against a large marginal population was hypothesized as a major factor in the extremely low rates of Japanese crime and delinquency in the United States.

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THE GENERALITY OF SIMPLICITY-COMPLEXITY OF SOCIAL PERCEPTION IN A HIGH SCHOOL POPULATION*[1]

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A. INTRODUCTION

Research on simplicity-complexity of social perception has focused primarily upon the number of different verbalized dimensions college subjects (*S*s) use to organize social stimuli (2, 3, 7, 16, 18, 20). Perceptually simple *S*s use a small number of dimensions, while complex *S*s use a larger number. Since the *S* who is extremely simple in social perception tends to be aware of only that small fraction of sensory input that fits into his highly restricted number of organizing dimensions, it is assumed that he loses perceptual contact with his social environment (11). But the assumption that the *S* who uses a relatively large number of dimensions has more accurate information about his social world than one who is in the middle group on number of discriminable dimensions may be incorrect. Dividing sensory input into a larger number of discriminable dimensions may enable *S* to make finer discriminations between social stimuli, but will not necessarily enable him to perceive *relationships* between stimuli ordered in different dimensions.

There is growing evidence that the construct of simplicity-complexity of social perception has little generality across attitude, intelligence, or competence measures (3, 11, 17). The purpose of the present study was to test the generality of simplicity-complexity of social perception across several attitude measures using high school students rather than college students as *S*s.

1. *The Construct of Simplicity-Complexity of Social Perception*

The human organism tends to simplify the enormous complexity of social stimuli he receives from others by ordering the stimuli along dimensions of discrimination he has developed for organizing sensory input. The term scale

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is used to describe the organizing mechanisms rather than construct (6), category (4), or concept (5), since stimuli tend to be organized in terms of the amount of some attribute (heavy-light, good-bad, intelligent-unintelligent, and so forth). The term *number of categories* is used to describe the number of discriminable points along a given scale: i.e., a scale may have two or more categories. The following two constructs are concerned with the degree of perceptual simplification.

a. Number of categories along a scale. The research of Volkmann (19) and others suggests that the number of discriminable categories along scales is determined by the range of stimuli *S* has experienced in the past and is experiencing at the time of judgment. An overriding attitude position affirming a dichotomous type of organization would also influence the number of discriminable categories *S* uses. The traditional western way of perceptual organization operates on the basis of dichotomous scales—scales with only two categories. An object is either A or Not-A, a person is good or bad, and there are no discriminable points in between. The *S* who discriminates on the basis of only two categories tends to make use of less sensory information than the *S* who uses many categories, while the *S* who uses many categories makes greater differentiation between stimuli than the *S* who uses only two categories.

b. Number of scales available to organize social stimuli. Most studies on simplicity-complexity of social perception have focused on the *number* of different dimensions *S*s use to organize social stimuli (2, 7, 8, 16). Kelly's Role Construct Repertory Test (6) attempts to measure individual differences in the number of different constructs (or scales) *S*s use to predict social behavior. An *S* who uses a small number of scales is theoretically less able to discriminate among stimuli than is an *S* who uses a large number of scales, while the *S* who uses a large number of scales makes greater differentiation among social stimuli than the *S* who uses a small number of scales.

2. *Attitudinal Rigidity Factor*

Four of the attitude measures that loaded above .30 on this factor in a previous study (11) were given to the *S*s in this study. Attitudinal rigidity is defined as the desire of *S* to maintain his perceptual organization and belief systems intact and resistant to change. The attitudinally rigid *S* tends to reject social stimuli or persons that would threaten to change his perceptual organization and belief systems.

a. Acceptance-rejection of change as an overriding attitude. The central notion is that the *S* who accepts change is open to new experiences that might change his perceptual organization and belief systems. The *S* who rejects change is closed to new experiences which might threaten his rigidly held attitudes and beliefs. In this study two measures of acceptance-rejection of change were given, Rokeach's (15) Dogmatism Scale and the Acceptance of Change Scale (11).

b. Rejection of people who are dissimilar to one's self. This construct concerns the extent to which *S*s tolerate persons who are different from the middle-class norm in behavior, attitudes, or personal appearance. The attitudinally rigid *S*, it has been suggested (11), rejects others who are not like himself, since he does not tolerate ambiguity resulting from great differences between people.

c. Reliance upon self vs. *reliance upon others.* Self-reliant *S*s, it is suggested, are able to tolerate contradiction of their judgments or negative evaluation by others, while *S*s low in self-reliance are more concerned with the judgments and evaluations of others. *S*s low in self-reliance are theoretically highly sensitive to evaluative responses by others. Thus, *S*s who rely more upon others than upon themselves may seek to maintain their self-concepts, attitudes, and ways of perceiving in a rigid, unchanging condition to insure that others will not reject them.

3. *The Rationalism Factor*

It is suggested that the *S* who endorses a rational attitude tends to prefer to make important decisions through an attempt to apply all the available knowledge of concepts and facts. The rational *S* desires to control his behavior in accordance with rational values, while the relatively irrational *S* prefers to be spontaneous. In addition, the rational *S* tends to reject the element of chance, the indetermination of objective reason, the primary process, intuition, or the irrational. In the previous study, the rationalism variable was independent of the attitudinal rigidity factor but was related to number of discriminable categories (Pyron, 1966a).

B. METHOD

1. *Subjects*

Seventy-two high school students, 50 females and 22 males, from Central High School in Madison, Wisconsin, were used as *S*s. The *S*s ranged in age from 15 to 18. All *S*s were given the following measures.

2. *Simplicity-Complexity of Social Perception*

a. Number of categories along a scale. *S*s were asked to fit real people known to them to eight roles, such as "The most outstanding teacher you have known." Each of the eight role persons was rated on a 30-item adjective list taken largely from the Semantic Differential (9). Nine scale positions and four verbal anchors were provided for each of the 30 adjective scales. To the extent that *S* gave different scale positions to different role persons, it was assumed that he was able to discriminate among them along the scales. The measure was the number of different scale positions used for each adjective scale, summed across all 30 scales. The higher the score, the greater the number of categories used on the scales.

b. Number of discrimination scales—The Revised Role Repertory Test. This test was developed from Kelly's (6) original Role Construct Repertory Test. *S*s were asked to fit real people to seven roles, six being the same as those used for measuring number of categories. Then they considered these role persons in pairs. Twenty-one pairs were used in this study. *S*s were told to give five characteristics for each pair of role persons, ways in which the two were alike or different. The measure was the number of different bipolar adjective scales used by *S*s to describe the ways the members of pairs differed. Scales used in describing how they were alike were not scored. The higher the score the greater the number of scales of discrimination used to differentiate the role persons.

3. *Attitudinal Rigidity Factor*

a. Openness vs. *closedness of beliefs—The Dogmatism Scale.* Developed by Rokeach (15), this scale is construed as a measure of openness *vs.* closedness of belief systems. It is assumed to be independent of the content or direction of belief, measuring openness to new concepts or stimuli that might change the belief system *vs.* closedness to concepts and stimuli that might threaten *S*'s established belief system. The 40-item Form E of the Dogmatism Scale was used, and *S*s were provided with a six-point scale with six verbal anchors for each statement. Agreement with any statement was scored in the dogmatic direction.

b. The Acceptance of Change Inventory. The items of the Change Inventory (10, 11) fall into the following groups: 1) a desire for order, certainty, and a knowledge of what one will be doing in the future; 2) the value of flexibility; 3) acceptance of change in human society; 4) sensitivity to change in the natural world; 5) a desire to live for the present rather than the future; and 6) affirmation of new experiences that change one's outlook. There were 18 items in the scale. Half were worded in a change direction and half in a rejection of change direction. Agreement with a change statement was scored, and disagreement with a rejection of change statement was scored. Each statement was rated along an 18-point scale with six verbal anchors: the higher the score, the greater the acceptance of change.

c. The Rejection of People Test. Eight statements dealing with prejudice toward Jews, Negroes, and other minorities were taken from the Ethnocentricism Scale of Adorno, *et al.* (1). Seven new statements were written (11) which expressed rejection of "beats," the Student Socialist Party, "arty" students, students who have wild parties, and men with long hair or beards. *S*s responded to each item on a six-point scale: the higher the score, the greater the rejection of people.

d. The Self-Reliance Test. The items of this scale fall (11) into the following three groups: 1) the desire to conform to the expectations of others regarding behavior; 2) the desire to lose oneself in group activity *vs.* the desire to be alone; and 3) the desire to be an individual, to develop one's values and attitudes on the basis of one's own experiences rather than on the basis of those of others. There were 14 items in the scale. Half were worded in a self-reliant direction and half in a reliance upon others direction. Agreement with a self-reliant item was scored, and disagreement with a reliance upon others item was scored. Each statement was rated on an 18-point scale with six verbal anchors: the higher the score, the greater the self-reliance.

4. *The Rationalism Factor*

Ten of the 17 items of the Rationalism Inventory (11) expressed a desire to be "guided by one's total intuitive feelings," to follow one's "deepest impulses," to express emotion directly and be spontaneous, while the remaining seven items expressed the desire to make important decisions by rationally and carefully weighing all the possible facts and alternatives, the desire to suppress spontaneous emotion, irrationality, and the desire to impose methodological rules upon one's experience. *S*s rated each item on a six-point scale with six verbal anchors: the higher the score, the great the rationalism.

C. RESULTS AND DISCUSSION

Product-moment correlations were computed between each of the seven measures described above. The 7 × 7 matrix of intercorrelations, shown in Table 1, was factor-analyzed by the Varimax procedure, with IBM equipment. Two factors which accounted for a total of 79.5 per cent of the common variance were interpreted. Interpretation is based on variables with factor loadings of .60 or higher. The rotated factor matrix is shown in Table 2.

TABLE 1

PRODUCT-MOMENT INTERCORRELATIONS OF THE SEVEN MEASURES

Measure	1	2	3	4	5	6
1. Number of Categories						
2. Revised Role Repertory Test	.53**					
3. Dogmatism	—.01	—.21				
4. Acceptance of Change	.11	.22	—.43**			
5. Rejection of People	—.12	—.18	.51**	—.30*		
6. Reliance upon Self	.05	.10	—.31**	.42**	—.20	
7. Rationalism	—.05	—.04	.23*	—.22	.22	—.21

* $p < .05$.

** $p < .01$.

TABLE 2

ROTATED FACTOR MATRIX

Measure	A	B	C
1. Number of Categories	—.01	.88	.04
2. Revised Role Repertory Test	.19	.85	.03
3. Dogmatism	—.74	—.06	—.16
4. Acceptance of Change	.68	.16	.14
5. Rejection of People	—.63	—.16	—.17
6. Reliance upon Self	.64	.02	.08
7. Rationalism	—.28	.01	—.76
Per cent of Common Variance	48.13	31.48	20.39

1. *Factor A, Attitudinal Rigidity*

Factor A includes Dogmatism, —.74; Acceptance of Change, .68; Reliance Upon Self, .64; and Rejection of People, —.63.

This factor is very similar to the attitudinal rigidity factor of the previous study (11) except that the F Scale and the Taylor Anxiety Scale were not given in this study. The finding that simplicity-complexity of social perception was independent of this factor confirms the results of the previous study. In this study and in the previous factor-analytic study that used *S*s from a Wisconsin state college population, Dogmatism and Acceptance of Change had the highest loadings on the attitudinal rigidity factor. However, in a third factor-analysis (14) that used University of Wisconsin sophomores as *S*s, Rejection of People and Rationalism had the highest loadings on a similar factor, which included Self-Reliance, Dogmatism, and Acceptance of Change. The lower loadings for Dogmatism and Acceptance of Change in that particular study may be due to differences in populations. The relative size of the factor loadings for Dogmatism and Acceptance of Change are high for both state college and high school *S*s but are relatively low for university *S*s. In addition, Rationalism was not part of the attitudinal rigidity for state college or high school *S*s, but was highly loaded on this factor for university *S*s. Perhaps the rational *vs.* spontaneity attitude dimension is not as important for high school and state college *S*s as it is for university *S*s.

The four variables of Factor A suggest the interpretation that this factor involves acceptance *vs.* rejection of stimuli that might change or be potentially threatening to *S*'s established perceptual and attitude systems. The loading of the Reliance upon Self Test on this factor tends to confirm the hypothesis that *S*s who are highly concerned about what others think of them seek to maintain their attitudes and perceptions in a rigid, unchanging condition. *S*s who are low in self-reliance, it is suggested, fear that any change in their attitudes or behavior will lead to rejection by others, or even by themselves. To enhance their group-identity, *S*s low in self-reliance may tend to reject those who exhibit behavior that is not in accord with their perception of the cultural norms of the group to which they feel they belong. In addition, attitudinally rigid *S*s do not, it is suggested, tolerate great differences in people, since the differences might tend to threaten the *S*'s own established attitudes. Thus, Rejection of People is negatively loaded on the attitudinal rigidity factor.

2. *Factor B, Simplicity-Complexity of Social Perception*

Factor B includes Number of Discriminable Categories, .88; and Number of Scales of Discrimination, .85.

The finding that the Revised Role Repertory Test, construed as a measure of number of scales of social discrimination, correlates positively with number of categories and that these two measures form a relatively independent factor confirms the results of the previous study (11). However, sex attitude was highly loaded on the simplicity-complexity factor in the previous study. No measures of positive *vs.* negative attitude toward sexuality were given to the high school *S*s of this study, for reasons which should be obvious.

3. *The Simplicity-Complexity Construct*

This study tested the generality of the simplicity-complexity construct across five attitude measures with high school rather than college students as *S*s. Simplicity-complexity of social perception was a separate factor, independent of all five attitude measures, in this study.

There is growing evidence that the simplicity-complexity construct as measured by the Kelly Role Construct Repertory Test or similar measures has limited generality (2, 11, 14, 18). Small but consistent positive correlations have been found, however, between degree of complexity of social perception and accuracy of interpersonal perception (3, 10, 12, 17). Vannoy (18) found that his measure of simplicity-complexity, the Bieri Test of Cognitive Complexity, was related only to measures of *S*'s overemphasis on one particular attribute in social perception and to tolerance-intolerance of trait inconsistency. Small positive correlations have been found in two studies (10, 11, 13) between degree of complexity of social perception and degree of positive attitude toward sexuality. In another study, simplicity-complexity was significantly related to acceptance-rejection of ambiguous art (13). These findings suggest that simplicity-complexity as a personality construct is limited to measures reflecting a "black *vs.* white" type of perception or desire to categorize stimuli along a single dimension. While simplicity-complexity of social perception is related to measures of tendency toward extreme dualistic perception, it apparently does not relate to attitudes of rejection or acceptance of change (10, 11, 14), independence of judgment (18), reliance upon self (10, 11, 14), authoritarianism (18), rejection of people (11), intelligence (3), interpersonal competence (14), or neuroticism (3).

D. Summary

From 72 high school students were obtained two measures of simplicity-complexity of social perception: number of discriminable categories along scales of discrimination applied to persons and number of verbally different bipolar scales used to discriminate among persons. Five attitude scales were also given: The Dogmatism Scale, The Acceptance of Change Inventory, The Rejection of People Test, The Self-Reliance Test, and the Rationalism Inventory. Two factors that accounted for a total of 79.5 per cent of the common variance were interpreted. These factors were Factor A, Attitudinal Rigidity; and Factor B, Simplicity-Complexity of Social Perception.

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THE SCRIPTURAL LITERALISM SCALE: A PRELIMINARY REPORT*[1]

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A. INTRODUCTION

"Scriptural literalism" is a construct related to a program of research on the socioreligious attitudes of college students. The scale reported in the present paper was developed as a part of the instrumentation for this program of research now in progress at the University of Texas (4).

Scriptural literalism may be conceived as a continuum. At one end of this continuum is the belief that scriptural writings should be interpreted literally and as God-related. Scoring at the opposite end of the continuum is the individual who believes that scriptural writings should be interpreted freely, and as ordinary literature not related to a deity. Scriptural literalism, then, is defined as the degree to which an individual believes in a literal, God-related, interpretation of scripture.

Since an existing criterion measure for validation of the Scriptural Literalism Scale (SLS) is not available, it is necessary to seek evidence of construct validity. As noted by Cronbach and Meehl (2), construct validation is a process that continues indefinitely, with scraps of evidence for construct validity slowly accumulating through successive experiments. The present paper presents some preliminary evidence for the construct validity of the SLS.

If the SLS is to be accepted as valid, then it certainly must be capable of statistical discrimination between Unitarians and Southern Baptists. The well-known theological differences between these two bodies strongly suggest that

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they occupy different positions on the scriptural literalism continuum. For similar reasons, the SLS must also differentiate between Unitarians and Methodists.

Argyle (1, pp. 69-70) has suggested that there is a decline in "all aspects of religious activity" between the ages of 18 and 30; furthermore, Goldsen, Rosenberg, Williams, and Suchman (3, p. 164) reported that college students are less likely to have well-established norms for religious belief than for other "institutional areas." It would be expected, therefore, that college freshman would score higher on the SLS than would college seniors.

B. Method

A pool of 30 statements about the interpretation of scripture was constructed. These items were administered to 17 male and 26 female undergraduate students with instructions to express their degree of agreement or disagreement on a five-point bipolar scale ranging from "disagree strongly" to "agree strongly." The responses of *S* to the 30 items were weighted 1, 2, 3, 4, or 5, with 1 = "disagree strongly" and 5 = "agree strongly." Item weights were reoriented where necessary for scoring, and the Pearson product moment coefficient of correlation of each item with the sum of the other items in the pool was computed. The 16 items having the highest correlation with the sum of the other items in the pool were selected for a shorter version of the scale (SLS_c). In addition, two 12-item parallel forms of the scale (SLS_a and SLS_b) were constructed. The items of the SLS_a, SLS_b, and SLS_c include such statements as "The scriptures contain religious truths," "Quotations appearing in the scriptures are accurate," "The scriptures are a collection of myths," and "The passage of time is accurately presented in the scriptures." The three forms of the SLS were included as part of a longer form (The "Attitude Survey") and were readministered to 309 University of Texas students, 375 University of Houston students, and 146 students from Southwestern University at Georgetown, Texas. These *S*s responded to the items according to the following scale: +1 = slightly agree, +2 = agree, +3 = strongly agree, —1 = slightly disagree, —2 = disagree, —3 = strongly disagree. The split-half reliability coefficients of the three scales were computed, corrected by the Spearman-Brown formula. The Pearson product moment intercorrelations among the three scales were also computed.

Single-classification analysis of variance was used to compare the scores of Unitarians and Baptists, Unitarians and Methodists, freshman and seniors, and males and females.

C. RESULTS

Table 1 presents the means, standard deviations, and split-half reliabilities of the three scales. The following intercorrelations among the three scales were obtained: between SLS_a and SLS_b, .92; between SLS_a and SLS_c, .98; between SLS_b and SLS_c, .96.

TABLE 1
MEANS, STANDARD DEVIATIONS, AND SPLIT-HALF RELIABILITIES OF THE SCRIPTURAL LITERALISM SCALE (SLS)

Scale	Mean	Standard deviation	Reliability[a]
SLS_a	3.83	16.63	.91
SLS_b	— .61	15.56	.91
SLS_c	4.86	22.53	.96

[a] Split-half, Spearman-Brown corrected.
Note: $N = 830$.

TABLE 2
RESULTS OF ANALYSES COMPARING SCORES OF UNITARIANS WITH SCORES OF BAPTISTS

Scale	Unitarian mean	Baptist mean	F	p
SLS_a	—20.44	18.82	228.53	$<.0001$
SLS_b	—23.17	14.45	191.41	$<.0001$
SLS_c	—28.78	25.95	238.78	$<.0001$

Note: Groups—18 Unitarians and 91 Baptists.

TABLE 3
RESULTS OF ANALYSES COMPARING SCORES OF UNITARIANS WITH SCORES OF METHODISTS

Scale	Unitarian mean	Methodist mean	F	p
SLS_a	—20.44	3.75	72.99	$<.0001$
SLS_b	—23.17	—1.44	51.99	$<.0001$
SLS_c	—28.78	5.43	68.22	$<.0001$

Note: Groups—18 Unitarians and 212 Methodists.

The results of the analyses of variance comparing the scores of Unitarians with the scores of Baptists are seen in Table 2. Table 3 contains the results of analyses comparing the scores of Unitarians with the scores of Methodists, Table 4 presents the results of analyses comparing freshmen scores with senior scores, and the results of analyses comparing male scores with female scores appear in Table 5.

TABLE 4
RESULTS OF ANALYSES COMPARING SCORES OF FRESHMEN WITH SCORES OF SENIORS

Scale	Freshman mean	Senior mean	F	p
SLS_a	6.81	1.22	10.47	$<.0017$
SLS_b	2.01	—2.16	6.21	$<.0126$
SLS_c	9.17	1.67	9.97	$<.0021$

Note: Groups—279 freshmen and 110 seniors.

TABLE 5
RESULTS OF ANALYSES COMPARING SCORES OF MALES WITH SCORES OF FEMALES

Scale	Male mean	Female mean	F	p
SLS_a	1.71	6.46	16.68	$<.0002$
SLS_b	—2.22	1.49	11.51	$<.0011$
SLS_c	1.82	8.64	18.71	$<.0001$

Note: Groups—421 males and 387 females.

D. DISCUSSION

It is apparent from the results presented in Table 1 that the split-half reliabilities of the three forms of the SLS are acceptable for most applications; furthermore, the correlation (.92) between the SLS_a and SLS_b is consistent with the estimates of internal consistency appearing in Table 1. The high correlations between the SLS_a and SLS_c and between the SLS_b and SLS_c may be attributed to the influence of the items of the SLS_a and SLS_b, which also appear in the SLS_c.

From Tables 2 and 3 it can be seen that the Unitarians scored consistently lower than either the Southern Baptists or the Methodists. Accordingly, these results are taken as preliminary evidence for the construct validity of the three SLS forms. As expected, the freshman means were significantly higher with respect to the three SLS forms than the corresponding senior means. These results are taken as further evidence for the construct validity of the SLS forms.

The results appearing in Table 5 are in need of some interpretation, since no prediction regarding sex differences was made. It can be seen that females in the sample tended to score higher than the males. The direction of the differences seems plausible in the light of the portrayal by Terman and Miles (6) of females as "severer moralists" than males, and Ringer's (5) finding that women are more involved in church life than are men. Females seem to be more "religious" in almost every sense of the word.

The present report presents only the early development of the SLS. Additional data must be gathered before the characteristics of the SLS can be further explored. For example, it is highly desirable that an estimate of the test-retest reliabilities of the SLS forms be obtained, and that additional evidence bearing on their construct validity be secured. The relationship of the SLS to other personality measures should also be investigated.

Although the SLS forms are of immediate relevance to the program of research mentioned earlier in this report, it is expected that these scales should prove of interest and use in experimental designs where a short—yet psychometrically adequate—measure of scriptural literalism is desired.

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THE OPENNESS AND AFFECT DENIAL SCALES: A PRELIMINARY REPORT*[1]

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A. INTRODUCTION

The two scales reported in the present paper have been developed as a part of a program of research on the socioreligious attitudes of college students. A need for measures of the constructs "openness" and "affect denial" led to an attempt to devise two short scales that would be valid and reliable measures of these constructs.

"Openness" is a construct applicable to the behavior of individuals in a small group. As conceived here, openness is the degree to which an individual is willing to be "publicly introspective." Individuals who are willing to speak candidly about themselves and their personal affairs are regarded as more "open" than are individuals who are relatively reticent in an intimate group discussion. It is important to note that (conceptually, at least) this willingness of the "open" individual to talk is not a compulsive need being fulfilled by the group situation. Instead, the "open" individual is not intolerably threatened by the verbal intimacies a well-acquainted group comes to share: with at least a moderate degree of comfort (depending upon how "open" he is) he opens his personality to others.

In the development of any new scale the issue of validity is one of the first concerns of the researcher. It would be most convenient if an acceptable criterion were available against which the openness scale could be validated. Unfortunately, no such criterion is available, and we must content ourselves with beginning the endless task of establishing construct validity (2). Accord-

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ingly, we state a demand we shall make of a scale if it is to be a valid measure of openness: *S*s who are members of a small discussion group must score higher on such a scale than *S*s who are not members of a small discussion group.

The construct "affect denial" concerns one's unwillingness to admit feeling affect or emotion. It seems necessary to make a distinction between *feeling* and *acting*. The construct "affect denial" does not concern how an individual *acts* in regard to affect he feels. Instead, we are interested in the assumption that an individual does feel, and that he may not be willing to report these feelings.

What should one demand of a valid measure of affect *denial*? As a start, it may be noted that social custom in the United States decrees that the adult male be restrained in the expression of affect. The female, on the other hand, is freer to admit feeling. If a scale is a valid measure of affect *denial*, then male *S*s must score higher than female *S*s.

B. METHOD

A pool of 83 items was constructed, including nine items assumed to be unrelated conceptually to either openness or affect denial. These nine items were placed in the item pool so that judges would, perhaps, be inclined to utilize a "?" category. The remaining 74 items consisted of 37 items assumed to be positively related to either openness or affect *admission* (+ items) and 37 items assumed to be negatively related to either openness or affect *admission* (— items).

In order to obtain at least a crude indication of the content validity of each item, a group of 12 judges[3] was utilized. These 12 judges were divided into four groups of three judges each, according to instructional set and item group. Two instructional sets were used: (*a*) judges were asked to judge each statement as if a hypothetical *S* had *agreed* with it (+ set), and (*b*) judges were asked to judge each statement as if the hypothetical *S* had *disagreed* with it (— set). One half of the judges were given the 37 + items and the nine "neutral" items. The other six judges received the 37 — items and the nine "neutral" items. The four groups of judges were, the following: (*a*) + set, + items; (*b*) + set, — items; (*c*) — set, + items; and (*d*) — set, — items.

Each judge was asked to sort his 46 items into three groups: (*a*) items related to "Construct A" (openness), (*b*) items related to "Construct B" (affect *admission*), and (*c*) a "?" stack containing items not clearly belonging in stack (*a*) or (*b*). Each judge was given a standardized set of instructions including definitions of each construct.

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[3] The authors wish to thank the following individuals who served as judges: Drs. Bunderson, Hakes, Harren, Jecker, Jennings, McGehearty, McGuire, Menaker, Phillips, Reid, Wilson, and Young.

The criterion for retention of any item in either scale was 100 per cent agreement among the six judges who considered that item. Items meeting this criterion were assembled in a form (the "Collegiate Attitude Profile") which was administered to 17 male and 26 female undergraduate students. Each *S* responded to each item by indicating his position on a five-point scale ranging from "disagree strongly" to "agree strongly." Responses were scored from 1 = "disagree strongly" to 5 = "agree strongly."

Items were collected into the appropriate scale, reoriented for scoring where necessary, and the Pearson product moment coefficient of correlation between each item and the sum of the remaining items in its scale was computed. Two 10-item parallel forms of the openness scale (OS_a and OS_b) were constructed from items correlating highest with the sum of the remainder of the openness items. Also, a longer openness scale (OS_c) was constructed from the 16 openness items correlating highest with the sum of the remainder of the openness items. In a similar manner one 14-item affect denial scale (ADS_c) and two eight-item parallel forms (ADS_a and ADS_b) of the affect denial scale were constructed.

The items in the above six scales were included in a longer form (the "Attitude Survey") administered to 375 students at the University of Houston, 309 students at the University of Texas, and 146 students at Southwestern University at Georgetown, Texas. In the "Attitude Survey" *S* indicated his response to each item according to the following key: + 1 = slightly agree, + 2 = agree, + 3 = strongly agree, — 1 = slightly disagree, — 2 = disagree, — 3 = strongly disagree.

Items were again collected into the appropriate scale, reoriented for scoring where necessary, and the odd-even split-half reliability coefficient of each scale was computed applying the Spearman-Brown Formula. The Pearson product moment intercorrelation coefficients among the six scales were also computed.

Single-classification analysis of variance was used to compare the scores of males and females on each of the six scales. A group of University of Texas students participating in discussion groups at the Wesley Foundation were also compared to the remaining University of Texas students tested.

C. RESULTS

From the original pool of items, 29 OS items and 21 ADS items met the criterion of judges' agreement. The 33 items not sorted into the same construct category were discarded from the item pool.

The OS items include such statements as "Personal questions don't bother me," "Some topics are simply unsuitable for group discussions," and "I confide in others rather easily." Among the ADS items appear such statements as "I seldom feel like crying," "Television commercials make me feel angry," and "I am afraid of spiders."

TABLE 1
MEANS STANDARD DEVIATIONS, AND SPLIT-HALF RELIABILITIES OF THE OPENNESS SCALE (OS) AND THE AFFECT DENIAL SCALE (ADS)

Scale	Mean	Standard deviation	Reliability[a]
OS_a	4.85	8.77	.75
OS_b	−1.14	10.59	.77
OS_c	3.87	14.82	.85
ADS_a	−2.41	6.39	.50
ADS_b	−4.89	6.73	.60
ADS_c	−4.80	11.31	.69

[a] Split-half, Spearman-Brown corrected.
Note: $N = 830$.

TABLE 2
INTERCORRELATIONS OF THE OPENNESS SCALE (OS) AND THE AFFECT DENIAL SCALE (ADS)

Scale	OS_b	OS_c	ADS_a	ADS_b	ADS_c
OS_a	.70	.90	−.01	−.01	−.03
OS_b		.92	.11	.07	.08
OS_c			.05	.02	.02
ADS_a				.64	.89
ADS_b					.89

Note: $N = 830$.

TABLE 3
RESULTS OF ANALYSES OF VARIANCE

	Group means				*F*-ratios		*p*	
Scale	A	B	C	D	A *vs.* B	C *vs.* D	A *vs.* B	C *vs.* D
OS_a	10.6	4.5	5.0	4.9	7.55	.04	$<.01$	.84
OS_b	8.9	−1.4	−.3	−2.0	17.00	5.05	$<.01$	.02
OS_c	15.7	3.5	4.5	3.4	11.40	1.01	$<.01$	.32
ADS_a	−2.4	−2.4	−.7	−4.3	.00	70.32	.99	$<.01$
ADS_b	−5.4	−5.1	−2.5	−7.4	.01	121.06	.86	$<.01$
ADS_c	−5.1	−5.0	−.5	−9.4	.00	148.93	.96	$<.01$

Note: Group A = 17 discussion group participants. Group B = 292 University of Texas students. Group C = 421 males. Group D = 387 females.

Table 1 presents the means, standard deviations, and split-half reliabilities of the six scales. The intercorrelations among the scales appear in Table 2.

Table 3 contains the results of the analyses of variance comparing the scores of discussion group participants with scores of other University of Texas students, and comparing the scores of males with the scores of females.

D. DISCUSSION

As can be seen in Table 1, the split-half reliabilities of the six scales suggest moderate internal consistency, and the correlations between parallel forms of the same scale (as seen in Table 2) fall in a range consistent with the split-half reliabilities. The OS and ADS appear to approach statistical, as well as conceptual, independence, as indicated by the correlations appearing in Table 2. It seems reasonable to conclude that the OS and ADS sample distinctly different domains of behavior.

The results presented in Table 3 conform to the demand that, with respect to the OS, members of a small discussion group must score higher than nonmembers. Accordingly, these results are taken as partial evidence for construct validity of the OS. It can also be seen from Table 3 that the ADS did not discriminate between the participants and nonparticipants; indeed, there seems to be little reason to expect such differences. In light of these expectations, it is perhaps convenient that the necessity of "explaining" unexpected results did not arise. It can be seen that the demand pertaining to the ADS has been met. As desired, females did indeed score lower on the ADS than did males; therefore, these results are accepted as some evidence for the construct validity of the ADS. The discrimination of the OS_b between the males and females is unexpected. Since the OS_a and the OS_c did not discriminate between the males and females, it is suggested that a cautious stance be adopted. If similar results appear in subsequent work with the OS, then some accommodation to the unexpected will have to be made.

It is apparent from the present discussion that extensive further research involving the OS and the ADS is essential before an accurate appraisal of the scales' utilities can be made. It is highly desirable that an estimate of the test-retest reliabilities of the scales be obtained. It is imperative that further evidence bearing on their construct validity be secured before any sweeping claims of validity be made.

There has been no attempt made here to establish any relationship of the scales to existing instruments in the domain of personality research. Stone (3) has, for example, proposed a more general notion of openness as the opposite of "guardedness." It would be helpful to have some empirical evidence bearing on the possible relationship between Stone's notion of openness and openness as presented here. The present conceptualization and instrumentation of affect denial may be related to Byrne's (1) concept of repression-sensitization. Additional data are necessary, however, before this can be explored.

Finally, substantive questions arising in the program of research mentioned earlier in this report may yield to investigation with the OS and the ADS. Does participation in group discussions cause an individual to become more "open"? How is affect denial related to the behavior of a client in a counseling setting? The answers to these and other questions will be sought in the continuing program of research of which the development of these scales is only a part.

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ATTEMPTED SUICIDE AND BODY IMAGE*[1]

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A. INTRODUCTION

Fisher and Cleveland (1) have attempted to find ways to evaluate the body image of individuals and, in particular, their boundaries and body surfaces. They used the Rorschach test and derived a rational scoring system for assessing the body image of individuals. They derived a "barrier" score and a "penetration" score. The scoring system has been tested in a wide variety of situations and the body-image boundary dimension has been found to correlate with psychosomatic symptoms, site of cancer, patterns of group behavior, and many other behaviors.

Of particular relevance to suicidal behavior is the finding that the reaction to stress by directing anger outwards rather than inwards was associated with a high barrier score (1, pp. 132-134). Fisher and Cleveland expect "the person with well-differentiated body-image boundaries to be more oriented toward the expression of anger outward against frustrating figures than would persons with less well-defined boundaries" (1, p. 132).

This accords well with the idea of the suicidal act as noted by Freud (2) and Henry and Short (3), who have viewed suicidal behavior as an act of inward-directed aggression (often as a reaction to stress) to be contrasted with acts of outward-directed aggression, such as homicide. It is also in accord with the ideas of Stenback and Blumenthal (8), who have suggested that suicidal individuals have a reduced care for bodily integrity. Stenback and Blumenthal reported that attempted suicide and alcoholism were positively related in psychiatric patients and that both of these behaviors were negatively related to hypochondria.

The aim of the present study, therefore, was to examine the hypothesis that

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suicidal individuals will have lower barrier scores and higher penetration scores than nonsuicidal individuals.

B. METHOD

All attempted suicides tested at the University of Rochester School of Medicine and Dentistry during the period January 1958 to July 1959 were used in this study. Of these 24 persons, one file was missing and the Rorschach protocols of three others were only partly legible. This reduced the sample of attempted suicides to 20. Each of these was matched for sex, age, and psychiatric diagnosis with one other patient tested during the same period who was not suicidal. The sample, therefore, consisted of 20 psychiatric patients who had attempted suicide and 20 psychiatric patients who were not suicidal.

The total sample consisted of 26 females and 14 males. The median age of the sample was 30 years and the range was 15 years to 55 years. The two groups did not differ in age on a median test (7); the chi square value for the test was zero. Of the total sample, 16 were diagnosed as psychotic, 10 as character disorders, and 14 as neurotic.

The protocols were scored independently by two judges, and differences between their decisions decided by discussion and reference to Fisher and Cleveland's instructions for scoring (1).

C. RESULTS

The two groups did not differ in the total number of responses given, when a median test was used ($X^2 = .40$, $df = 1$). The median number of responses given by the attempted suicides was 20 and the median number given by the nonsuicidal group was 24.

The groups did not differ in the number of barrier responses given, when, again, the median test was used ($X^2 = 1.97$, $df = 1$). The median number of barrier responses given by the attempted suicides was two and the median number given by the nonsuicidal group was four. The groups did not differ in the number of penetration responses given ($X^2 = .74$, $df = 1$). The median number of penetration responses given by the attempted suicides was 1 and the median number given by the nonsuicidal group was 2.5.

The differences were in the predicted direction, but again failed to reach significance when the proportion of barrier and penetration responses was calculated for each protocol (rather than the number of such responses). The chi square value on the median test was 1 for the barrier score and .10 for the penetration score.

When the proportions of barrier and penetration responses given were examined for the 20 matched pairs of subjects, it was found that 11 of the attempted suicides had a lower proportion of barrier responses than their matched nonsuicidal partner and nine had a higher proportion. For the penetration proportion it was found that 10 of the attempted suicides had a lower proportion and 10 had a higher proportion than their matched nonsuicidal partner.

D. Discussion

These results indicate lack of support for the prediction that attempted suicides would have lower barrier scores and higher penetration scores than nonsuicidal individuals. In the present study there was a nonsignificant tendency for the attempted suicides to have a lower barrier score, but they also had a nonsignificant tendency to have a lower penetration score.

This study adds to a growing body of evidence that fails to find any heuristic value in viewing suicide as an act of inward-directed aggression. Lester (5) failed to find that students who had attempted or threatened suicide differed from students who had never considered suicide, on an inventory measure of the tendency to direct aggression outwards and the tendency to use indirect methods of aggression. Lester (4) found no relationship between experiences of discipline and the prevalence of suicide in nonliterate societies, which might be expected if suicide is considered as an act of inward-directed aggression. Lester (6) also failed to find an association between discipline experiences and the presence of suicidal preoccupation in students.

It may be concluded, therefore, that the assumption that suicidal behavior constitutes an act of inward-directed aggression, to be contrasted with outward-directed acts of aggression such as homicide, may be erroneous.

E. Summary

It was predicted that suicidal individuals should differ in their body-image boundary dimensions from nonsuicidal individuals. This was tested in a study that examined the Rorschach protocols from a sample of attempted suicides and a group of individuals who had not attempted suicide. The prediction was not supported. This was seen as contributing to a body of evidence that indicates that the assumption that suicide is an act of inward-directed aggression may be incorrect.

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INDIVIDUAL ATTITUDE TOWARD RISK AND CHOICE BETWEEN PRISONER'S DILEMMA GAMES*[1]

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A. INTRODUCTION

The prisoner's dilemma is a mixed-motive two-person game that offers each person a choice of cooperative or competitive action.[2] Studies of American college students in experimental prisoner's dilemma games have revealed no personality measure that reliably predicts individual choice. The importance of mutual trust for cooperation has been established (2, 10), and over many trials male subject-pairs have been shown to cooperate more than female pairs (9). But more subtle personality measures have failed as predictors of cooperation (3, 7). The failure of personality variables to predict behavior may be due to the narrow range of choice afforded by the dilemma. In many conflict situations, over longer time periods, each party can influence the nature of the dilemma he faces.

Extension of the prisoner's dilemma to provide a matrix choice affords a model of increased relevancy for those situations that contain long-run as well as short-run actions. Moreover, the matrix choice permits a motivation distinction that the prisoner's dilemma does not afford. Within a given prisoner's dilemma, a subject might make a cooperative choice either because he regarded the gain from cooperating as high or the gain from defecting (competing) as low; there is no way to distinguish one motivation from the other. Individual preference for cooperation or defection opportunities can be revealed, however, through matrix choice. The present study investigates individuals' preferences to play in certain matrices rather than others, on the basis of definitions of cooperation and defection opportunities; a measure of preference for cooperative game matrices will then be compared with the individual's attitude toward social risk.

The relations among all the payoffs in any one prisoner's dilemma can be

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[1] For their helpful criticism and suggestions, I am indebted to Professors F. T. Dolbear, Jr., L. B. Lave, and V. H. Vroom of Carnegie Institute of Technology, and to Professor Arie Lewin of New York University.

[2] The prisoner's dilemma is described in (6) and (9).

represented, up to a linear transformation, by two ratios of payoff differences (9). The prisoner's dilemma offers four different payoffs to one person from the four possible outcomes: (*a*) both cooperate, (*b*) one person cooperates but the other does not, (*c*) one person does not cooperate but the other person does, and (*d*) both persons choose noncooperative actions. If we call these payoffs to person one *a, b, c,* and *d,* then his gain from cooperation may be represented by the payoff difference, $a - d$; his cost of attempting cooperation by the difference $d - b$; and his gain for breaking away from a cooperative agreement by the difference, $c - a$. Ratios of payoff differences, such as these, have been shown to influence behavior in prisoner's dilemma games. One such ratio, which has been linked to individual attempts at cooperation by Lave (5), compares the gain available from cooperation, $a - d$, with the cost of attempting cooperation, $d - b$. We can consider this ratio as a measure of the attractiveness of cooperation, $C = (a\text{-}d)/(d\text{-}b)$. A measure of the attractiveness of defecting from a cooperative solution can be represented by the ratio, $D = (c\text{-}a)/(a\text{-}d)$, which compares the gain for breaking away from a cooperative agreement, $c - a$, with the gain for cooperating, $a - d$. Either a greater value of C or a smaller value of D in any matrix would invite a greater number of cooperative choices because a high C value reflects a high gain for cooperation relative to the cost of attempting it, while a low D value reflects a small gain for defecting relative to the gain for cooperating.

A choice between two different prisoner's dilemma games can also be influenced by the C and D ratio values of the matrices. One individual may prefer to play in a game where C is higher in the hope that he can achieve a cooperative solution; another may prefer a game where D is higher, however, for he is attracted more by competitive rewards. If one game matrix dominates another because its payoff values equal or exceed those of the other, that will, of course, provide an easier basis for choice; if the a payoffs are equal in the two matrices and the d payoffs are also equal, the dominant matrix will offer equal or higher C and D ratios.

The longer-run matrix choices can be interrelated in complicated ways. This is so in real-world choices under conflict. In a market setting, for example, where a firm's price action may be cooperative or not cooperative (competitive), a game matrix choice corresponds to the firm's longer-run choice of its capacity. And each firm's choice affects the payoffs of both firms.[3] A similar analogy can be made for the decision to harden missile sights as a cold-war strategy. In some cases, the longer-run or matrix choice can lead to what could be called a strategist's dilemma because preferred independent long-run choices, if followed, will make cooperation still harder to achieve. Thus a dilemma can exist in long-run as well as short-run choice.

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[3] In a prisoner's dilemma representation of market choices, expansion of capacity has been shown to have an unambiguous effect on the cooperation and defection ratios, C and D (11).

Risk-taking has traditionally played an important role in strategic behavior. Although risk attitude measures have not been found related to choices within a prisoner's dilemma, they may be reflected in preferences between alternative prisoner's dilemma games. We should expect that persons who have a preference for less risky alternative actions are apt to seek a game where cooperation is easy to establish. Conversely, those fond of risk would be attracted by opportunities for large gains through defection from cooperative solutions.

B. Method

To investigate game matrix preference, 10 pairs of prisoner's dilemma games were prepared and presented to subjects. The 10 pairs are shown in Figure 1. To facilitate comparisons within each matrix pair, two of the four payoffs to each player were kept the same in the two matrices; payoffs for coincident actions on the part of the players (payoffs *a* and *d*) were kept the same. Dichotomous choices of the games they would prefer to play repeatedly were offered to 44 undergraduate males at the University of Virginia in two different groups of 22 students each. Two different forms were used within each group to reduce position bias.

Iterated (simultaneous choice) prisoner's dilemma games were explained to the subjects before they made their choices. One half of the subjects were in a group about to participate in prisoner's dilemma game experiments, while the remaining 22 were students in an intermediate economics course. Subjects for the game experiments had been recruited to work in an economics research project for which they were to be compensated. These subjects were allowed to think that their choices would influence the experimental games they would later participate in. In the economics class group, students' choices were solicited as part of a study which, they were assured, would have no effect on them.

Measures of the attractiveness of cooperation and defection are given in Table 1 for the 10 matrices shown in Figure 1. Pairs 1 through 5 present choices in which Matrix B dominates Matrix A. In Pairs 6 through 9, Matrix A offered a higher value for ratio *C* than did Matrix B, but Matrix B offered a higher value for ratio *D*. Thus, in these four pairs, Matrix A offered a more attractive opportunity to cooperate than did Matrix B; and Matrix B offered a more rewarding defection opportunity than did Matrix A. Pair 10 offered no difference in either the *C* or the *D* ratio. This assortment of game matrix choices allows investigation of two bases for game preference. First, we can see whether most subjects prefer dominant game matrices. Second, we can distinguish persons who prefer cooperative matrices from those who prefer ones with defection opportunities. Then, to determine whether matrix game choices are related to attitude toward risk, individuals' cooperative matrix choices can be compared with the Kogan and Wallach (4) measure of their social risk preference (SRP).[4]

(1)

		1	2
A	1	15,15	-5,25
	2	25,-5	5,5
B	1	15,15	-5,25
	2	35,-15	5,5

(2)

		1	2
A	1	15,15	-15,35
	2	25,-5	5,5
B	1	15,15	-15,35
	2	35,-15	5,5

(3)

		1	2
A	1	15,15	-5,25
	2	25,-5	0,0
B	1	15,15	-5,25
	2	45,-25	0,0

(4)

		1	2
A	1	15,15	-25,45
	2	25,-5	0,0
B	1	15,15	-15,35
	2	35,-15	0,0

(5)

		1	2
A	1	15,15	-15,25
	2	25,-15	5,5
B	1	15,15	-5,35
	2	35,-5	5,5

(6)

		1	2
A	1	15,15	-5,35
	2	25,-15	5,5
B	1	15,15	-15,35
	2	35,-15	5,5

(7)

		1	2
A	1	15,15	-5,25
	2	25,-5	5,5
B	1	15,15	-15,25
	2	35,-5	5,5

(8)

		1	2
A	1	15,15	-5,25
	2	25,-5	0,0
B	1	15,15	-15,35
	2	35,-15	0,0

(9)

		1	2
A	1	15,15	-5,25
	2	25,-5	5,5
B	1	15,15	-15,35
	2	35,-5	5,5

(10)

		1	2
A	1	15,15	-15,25
	2	35,-5	5,5
B	1	15,15	-15,35
	2	35,-15	5,5

FIGURE 1

TEN MATRIX PAIRS USED TO SOLICIT SUBJECT CHOICES

The number to the left in each cell is payment to the player choosing which game to play, A or B; the number on the right indicates the payoff of the other player. Of the choices within each matrix, Choice 1 is cooperative, Choice 2 is competitive.

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[4] The Kogan and Wallach social risk measure was chosen because it would yield a validated measure of attitude toward risk and it is economical to administer. It presents 12 social situations in which a subject has an opportunity to choose a risky alternative action. The subject is asked to estimate a minimum probability of success that the more risky action would have to possess in order for him to choose it.

C. RESULTS

From the first five matrix-pairs, dominant matrices were chosen by 88 per cent of the subjects. Thus, where dominance is present, it provides a strong basis for overall preference between games. If Matrix Pair 10 is excluded, the remaining pairs offer an opportunity to distinguish players who seek cooperative opportunities from those who prefer competitive ones. Persons who choose Matrix A either pass up an opportunity to take a dominant game-matrix (Pairs 1 to 5), or they select a matrix for which the *C* ratio is larger and the *D* ratio is smaller (Pairs 6-9). The total number of Matrix A choices is shown by subject in Table 2, together with the subject's SRP score.

TABLE 1
COOPERATION AND DEFECTION RATIOS OF FIGURE 1 MATRIX PAIRS

Matrix pair	Matrix A *C*	Matrix A *D*	Matrix B *C*	Matrix B *D*
1	1.0	1.0	1.0	2.0
2	.5	1.0	.5	2.0
3	3.0	.7	3.0	2.0
4	.6	.7	1.0	1.3
5	.5	1.0	1.0	2.0
6	1.0	1.0	.5	2.0
7	1.0	1.0	.5	2.0
8	3.0	.7	1.0	1.3
9	1.0	1.0	.5	2.0
10	.5	2.0	.5	2.0

We wish to test the null hypothesis that there is no relation between the cooperative game choice and aversion to risk measures against an alternative hypothesis that there is a positive relationship (one-tailed test). The measures with which we deal possess no genuine cardinal meaning, only an ordinal one. Each measure can be used to rank subjects, however, and the ranks can then be tested by the Spearman rank correlation method. Adjusted for tied ranks, the Spearman rank correlation coefficient for these data is .404, which is significant ($p < .01$) and leads to rejection of the hypothesis that there is no relation between the ranks. Persons who rank high in the above matrix-choice test of preference for competitive opportunities also tend to rank high in the Kogan and Wallach test of their preference for situations involving risk. Separate Spearman rank correlation coefficients calculated for the 22 subjects who were about to participate in prisoner's dilemma experiments and the 22 subjects from an economics class were each significant at the .05 level. Coefficients were .42 and .41 (adjusted for tied ranks), and the criterion at the .05 level in each of these cases is .36. The strength of the relationship thus seems uniform across these two groups of subjects, even though their motivation might have been different.

After these tests were completed, an effort was made to distinguish high and low SRP subjects, to examine separately their effectiveness in predicting matrix choices. The SRP score and matrix choice data in Table 2 were divided into two halves by high and low SRP scores, and ranks of corresponding matrix choices were then reassigned within each smaller sample. The high SRP score group produced a Spearman rank correlation coefficient of .443 (adjusted for tied ranks), which exceeded the criterion value of .36 at the .05 level of significance (one-tailed test). Among low SRP scores, however, the Spearman rank correlation coefficient was only .125 (adjusted for tied ranks), a value that is not significant. This result indicates that the relation between SRP score and tendency to cooperate is stronger among those persons who avoid risky situations.

TABLE 2
MATRIX A CHOICES AND SOCIAL RISK PREFERENCE SCORE BY SUBJECT

Subject*	SRP score	Matrix A choices	Subject*	SRP score	Matrix A choices
7-1	84	4	13-1	64	4
7-2	68	3	13-2	76	4
7-3	76	3	13-3	76	0
7-4	60	0	13-4	80	5
7-5	50	4	13-5	66	5
7-6	63	2	13-6	73	4
7-7	57	0	13-7	84	5
7-8	85	2	13-8	60	3
7-9	76	0	13-9	60	3
7-10	94	5	13-10	67	4
9-1	83	4	13-11	68	1
9-2	64	0	13-12	61	0
9-3	84	5	13-13	86	6
9-4	92	4	13-14	79	3
9-5	65	3	13-15	67	0
9-6	69	4	13-16	60	0
9-7	48	0	13-17	74	1
9-8	78	0	13-18	80	6
9-9	62	3	13-19	66	4
9-10	54	4	13-20	62	2
9-11	82	2	13-21	68	0
9-12	80	3	13-22	82	2

* Subjects are identified by numbers. Those preceded by 7 and 9 are from experimental groups; those preceded by 13 are from the economics class group.

D. DISCUSSION

A strategic dilemma can arise in long-run choice that seems amenable to experimental investigation along the lines of prisoner's dilemma games. The connection of risk attitude with matrix choice suggests that the force of a strategist's dilemma will vary with the individual players. Two risk-averse persons may observe no real choice dilemma because both prefer a setting that facilitates cooperation. But facing the same situation, two persons more tolerant of risk may each prefer long-run actions that make cooperation difficult, and so are in conflict with their collective interests. Thus, risk attitudes not only affect individual choice of long-run alternatives, they can also determine the extent to which a long-run dilemma is perceived.

The separation of long-run and short-run choice that is suggested here may help to reconcile prior results regarding risk attitudes and cooperation. Groups have been found to accept more risk than individuals in the Wallach and Kogan test of risk preference (1, pp. 656-708; 12), yet in prisoner's dilemma games, pairs of persons acting as one decision unit cooperated more than individuals (8). The results reported here suggest that groups would tend to select games that offered more competitive opportunities, since groups are more willing to accept risk than are individuals. Once in any particular game, however, groups could still achieve a higher degree of cooperation than individuals.

E. Summary

Prisoner's dilemma experiments preclude long-run, strategic choices of game matrices; they only permit a choice of action within a given matrix. So confined, the experiments have not revealed any reliable connection between personality measures and cooperative behavior. Here, a basis for game-matrix preference has been examined as an analogue to long-run choice, and found related to individual risk attitude. Two structural influences on game-matrix choices were distinguished. Dominance in payoff comparisons was found to lead to strong preferences. More subtle distinctions were also made, with the use of cooperation and defection measures that reflect relations among different payoffs in each prisoner's dilemma game matrix. Based on these latter distinctions some individuals indicated an interest in matrices that offered higher cooperation but lower defection measures, while others tended to prefer matrices with higher defection but lower cooperation measures. Those who preferred cooperative matrices tended to be more averse to social risk than those who preferred matrices with higher defection measures.

The relation between risk avoidance and preference for cooperative games was stronger than that associating high tolerance for risk with preference for competitive games, where the relation was positive but not significant. The relationship between SRP score and matrix choice was equally strong among subjects, however, whether they expected that their choices would influence which matrix game they would later play in or they were simply expressing choices that had no future consequences for them.

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ACADEMIC UNDERACHIEVEMENT: A SUGGESTED THEORY*[1]

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A. INTRODUCTION

A tremendous degree of interest is being focused in the United States on the problem of academic underachievement, especially among our bright and gifted youth. It would, therefore, seem desirable to elucidate the problem and offer hypotheses for further thinking and research in this fruitful area.

The world atmosphere today places an extremely high premium on "full production." Since the advent of the Space Age, it has almost become a duty to utilize one's intellect to the fullest, even to strain one's self in the process. Such a compulsion to perform, when coupled with the need to comply with strong societal pressures, may not be at all congruent with a deeply internalized, well-motivated, system of ego-involved achievement needs. In addition, this complex problem rests upon a series of interlacing factors, such as understimulation of the child in school, lack of curricular creativity and flexibility, a low public image of the educational system, a replacement of quality ambition by quantity ambition, an encroachment of utilitarian goals over cultural goals in education, etc. There are, then, more reasons for academic underachievement than lack of effort or absence of positive motivation within the pupil. Otherwise, we should still be treating the pupil simplistically like a rat in a maze or like a machine.

Academic underachievement is here defined as *a significant and sustained disparity between capacity and performance, which defies rectification through stimulation, tutoring, and exhortation*. The disparity obtains when measured intelligence contradicts class tests, achievement tests, and teachers' impressions.

Looking more closely at a typical academic underachiever, we find a basic disparity between his self-concept and what he feels is expected of him; he also feels trapped, pessimistic, confused, and depressed. Clinical evaluations for diagnostic purposes and psychotherapy of over 100 youngsters between the

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ages of 12 and 16 years revealed the following dynamics: intellectual undernourishment at home, basic insecurity, a low repression threshold, overintrospectiveness, pedantry, body-image disturbance, absence of an ego-ideal, wide scatter on intelligence tests, and a precipitous loss at puberty of one's "blind faith" in parents, teachers, doctors, the clergy, and the law.

Etiologic factors that have been invoked in the past include an unconscious *need* to fail, passive resistance, retribution for parental rejection, and secondary gains of neurosis. I would like to suggest that a developmental theory of underachievement is demanded by the confusion of disparate data and the avalanche of passionately proposed remedies. Accordingly, the following sequence is offered to account for the underachievement syndrome in terms of inexorable stages of development, rather than of psychopathology.

B. THEORY OF UNDERACHIEVEMENT

1. *Assimilation-Recall Disparity*

Since the syndrome afflicts immediate recall more than fundamental learning capacity, we find a gulf between material that is assimilated and that is reproducible at examinations. This constitutes the first stage: that is, the Assimilation-Recall Disparity.

2. *Test Anxiety*

In the second stage, the resulting failure experience with low test marks, pressures from parents and teachers, produces a situation where further competitive classroom pressure becomes ego-dystonic. Test anxiety, which may increase the efforts of some adolescents, is now disjunctive in its effects on this group.

3. *Intellectualization of Failure*

By now, the youngster is a severe underachiever who can be identified by the rapid flow of rationalizations of his failures and by his projection of blame upon others. He is now functioning at a vastly reduced level of efficiency.

4. *Breakdown of Intellectualization*

The reality situation continues to elicit failure, while special helps like tutoring and psychotherapy serve to break down the structure of rationalization and projection. The outstanding clinical symptom is now regression.

5. *Ego-Deflation*

By now the individual feels stupid and hopeless. It is in this stage of decompensation of the self-concept that the disparity between assimilation and recall is at its worst. The clinical symptoms are depression, neurasthenia, and somatization of anxiety. This is indeed rock-bottom!

The child now approaches a turning point. Will the disjunctive process continue to overwhelm him in his state of failure feeding on failure, or will he start to rally?

6. *Utilization of a Shortened Ego Perimeter*

Through ego-deflation the child has reduced his demands upon himself and has altered his self-concept. This shortened perimeter allows for a higher sense of satisfaction with lower output, which permits a reinflation of his ego.

7. *Reduction of Test Anxiety*

With increasing ego-strength, and a consequent reduction of the intellectualizing mechanisms, the youth can now gradually increase his expectations for himself and, thus, decrease the gulf of underachievement.

8. *Reduction of Assimilation-Recall Disparity*

Reconditioning occurs through a series of graduated successes.

C. DISCUSSION

It seems in practice that, once initiated, the cycle must run its course and cannot be readily reversed as to directional flow. The task, then, for the therapist, would be to discover what stage the child is at and then help him work through from that stage to the final culmination of his improvement. In working with underachieving superior boys and girls, it is also essential to assess properly the true degree of ego-strength and not be misled by seeming strengths or weaknesses. In the primary classes, the ego-structure of the gifted seems to be stronger than average. In the pubertal years, the strength of the ego seems to be weaker than average, at times even fragile. In adolescent years, the gifted youngsters polarize either toward greater ego-strength and integration or toward ego-disintegration and antisocial patterns. Thus, the postpubertal period, especially for the superior boys, becomes a critical stage for adjustments for future life.

An additional view of underachievement in superior youngsters may be formulated in terms of the bright child's being more sensitive and, therefore, more vulnerable to traumatic experiences, especially in critical stages of his development. His needs for oedipal and identificational experiences are greater, thus rendering him more parent-fixated with greater ambivalence problems to be resolved. The keynote here would be a greater need for autonomy, a greater drive toward it with, however, greater restraints placed upon it. The resulting stresses and strains could account for underachievement.

D. CONCLUSIONS

The hypotheses offered here suggest that underachievement is better seen as a sequential, even if disjunctive, pattern of pubertal-adolescent development, rather than a pathological syndrome. This has many implications which await exploration. For example, it may be more important to determine in which stage a youngster finds himself in this eight-stage cycle, rather than determine the intensity of his symptomatology. Thus far, it has been observed that widely divergent counseling and psychotherapeutic methods seem to be optimal at different stages. It may also turn out that certain educational methods may be found either to accelerate or block a youngster's emergence from one of these stages.

In the final analysis, each young person needs to achieve a homeostatic relationship between his self-mastery and his self-direction, for only out of a proper fusion of both of these forces does his self-actualization emerge.

E. SUMMARY

After defining academic underachievement in its sociological context, a theory of underachievement is presented that is based upon an inexorable sequence of eight developmental stages rather than on psychopathology, thus offering the possibility of a new approach for psychotherapy of underachievers.

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SCALES FOR MEASURING DEPRESSION AND ANXIETY*[1]

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A. Introduction

The purpose of this paper is to present the items of two new scales of anxiety and depression and to describe the series of studies that produced them. Depression and anxiety appear to be important at a symptomatic level: Zigler and Phillips (26) found that depression was the most common symptom recorded for 793 patients admitted to their hospital over a 12-year period, occurring in 38 per cent of the cases. Tension was the second in a list of 35 symptoms occurring in 37 per cent of the cases. At a measurement level, however, there has been little in the way of success in measuring depression and anxiety.

Comrey (7) factor analyzed the Depression (D) scale of the MMPI (16) and found 17 factors. The one that appeared most like depression was made up of only five items. The factor of greatest importance in the analysis appeared to be a general neuroticism factor. Freudenberg and Robertson (14) found that scores on the D scale of the MMPI correlated significantly with scores on the depressed-state scale of Wittenborn's Rating Scale (25), but the correlation with scores on the acute anxiety state scale of Wittenborn's Rating Scale was almost as high. When Foulds and Caine (13) compared the D scale scores of the MMPI of 20 paranoid states, 20 psychoneurotic depressives, and 20 psychotic depressives, they found that the scale distinguished only between the paranoid states and the other three groups. Scores on the MMPI scales generally appear to be contaminated by the effects of social desirability (10) and acquiescence (19). Although Block (5) pointed out that the case for these response sets may have been overstated, he emphasized the need for control of such responses in the development of inventories.

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Becker (2) found that the depression scale of the Guilford Martin Personality Scales had a loading of .83 on a factor definable as "anxiety."

Anxiety scales appear to have fared no better. Sampson and Bindra (22) found a correlation of —.003 between Taylor Manifest Anxiety Scale (MAS) scores (24) and the dichotomy "anxiety neurotics" and other types of neurotics. Matarazzo, Guze, and Matarazzo (18) also found that the MAS did not differentiate well within psychiatric groups. Bendig (3) found that MAS scores were highly correlated with scores on a number of general neuroticism scales. That these results are typical is suggested by Sarason's review (23).

B. Development of the Scales

Because of the unsatisfactory nature of the existing scales, an attempt to develop new scales appeared justified. The items making up the final scales were selected on the basis of a number of studies conducted independently by the authors and two final studies conducted jointly. The studies conducted by Comrey have been published (8, 9). The studies conducted by Costello have not been published and an account of these studies will be given before presenting the final joint study. For the first factor analytic study an inventory containing 200 items was prepared and administered to 191 men and 191 women in groups ranging in size from 10 to 115 subjects. The ages of the subjects ranged from 17 to 59 years. A variety of occupations was represented —college students, nurses, psychiatrists, firemen, airmen, and theological students.

The 200 items were written in terms of their face validity for measuring depressive predispositions. Some of the items were similar in content to items in Cattell's 16 Personality Factor Test (6) and the MMPI (16).

All the items were intercorrelated using phi coefficients and the resulting matrix factor analyzed. Ten factors were extracted by the Principle Axis Method and were rotated to orthogonal simple structure with the use of Kaiser's normalized varimax criterion (17). There was a large drop in per cent variance accounted for from the first factor to the remaining factors, and only the first factor was given further consideration. Thirty items with the highest loadings on this factor were combined into a scale and administered with Bendig's Emotionality Scale (4), Taylor's Manifest Anxiety Scale (24), and the Neuroticism scale of the Maudsley Personality Inventory (12) to 50 consecutive admissions (excluding those obviously psychotic, brain damaged, or undergoing drug treatment) to a psychiatric unit. The correlations between the scores on the 30-item scale and the above three scales were .86,

.57, and .80 respectively. These results clearly indicated the need for further factor analytic studies.

A new inventory containing 102 items was prepared. This was made up of the 30 items selected on the basis of the first factor analytic study of the original 200 items, 23 items of Bendig's Emotionality Scale (4), 34 of Taylor's MAS items (24), 10 of Eichman's anxiety items (11), and the five items of the MMPI D scale that Comrey (7) found to be loaded on the factor identifiable as depression. Omissions of items from some of the scales was due to item overlap between scales. One of the main aims of this second item-analysis study was to try to obtain two homogeneous item dimensions, one made up of depression items and the other of anxiety items.

The new inventory was administered to 100 male and 100 female subjects—nursing students and students from a teachers' college. The 102 items were intercorrelated and factor analyzed in the manner described for the 200-item scale. The items with high loadings on each of the first 10 factors extracted, and which had minimal loading on the remaining nine factors, were examined.

An examination of the content of the items suggested that Factor II was most like "depression" and that Factor IV was most like "anxiety." It was decided at this stage to look at the criterion validity of the scales being developed. In the interests of reliability, items were added to those making up Factors II and IV. The items added had appreciable loadings on their respective factors, but had loadings only a little lower on one or more of the remaining eight factors. No item was added to Factor II or IV if it had a loading greater than .25 on the other factor of this pair of factors. This resulted in 21 items making up a scale of depression and 18 items making up a scale of anxiety.

Scores on these two scales for 240 normal subjects, 120 males and 120 females, were intercorrelated producing a coefficient of .49. The scores on the two scales for 90 consecutive admissions to a psychiatric unit (excluding only those who were apparently too sick to understand or to cooperate) produced an intercorrelation coefficient of .62. The split-half reliabilities of the two scales within the psychiatric sample were .82 ("depression" scale) and .73 ("anxiety" scale). The two scales were also administered to 33 patients diagnosed independently of scale scores and for whom the diagnosis included one or both of the words "anxiety" and "depression."

Each patient was placed by his psychiatrist into a high- or low-anxiety group and a high- or low-depression group. This was done without knowledge of the scale scores. The results of the study are presented in Table 1.

It can be seen that the scores on the "depression" scale are significantly different when the high-depression group is compared with the low-depression group. The scores on the anxiety scale are significantly different in the comparison between the high-anxiety group and the low-anxiety group.

This study indicated that, despite the multifactorial nature of some of the items on the scales, the scales had some validity. In order to produce more homogeneous item dimensions, it was decided by the authors to combine the six "good depression items" obtained in Comrey's studies with the 11 "good depression items" from Costello's study into a new depression scale and to combine the nine "good anxiety items" from the Costello study with the three "good anxiety items" obtained in Comrey's studies to form a new anxiety scale. The 29 items making up these two scales were combined with the items of Comrey's "Truth Scale" and the items of his "Social Desirability scale" (8) to form a new inventory of 42 items.

TABLE 1
SCORES ON THE DEPRESSION AND ANXIETY SCALES FOR PATIENTS RATED HIGH OR LOW IN DEPRESSION AND ANXIETY

Ratings by psychiatrists	Mean scores on depression scale	Mean scores on anxiety scale
High depression	14.38	12.90
Low depression	9.67	12.42
	$t = 7.633$	N.S.
	$p < .001$	
High anxiety	12.39	14.22
Low anxiety	13.20	10.47
	N.S.	$t = 5.859$
		$p < .001$

Data on the 42-item scale were obtained from 201 male and 366 female normal subjects. For the factor analysis the variables of sex, age, and marital status were added. The matrix of intercorrelations between the 45 variables was analyzed by the method of minimum residual factor analysis (9). The factors were rotated by Kaiser's normal varimax procedure (17), and this was followed by oblique rotation for simple structure and meaningfulness.

Four factors were obtained. The first factor was identifiable as "depression," the second as "anxiety," the third as a "Truth-Social Desirability" factor and the fourth as an "age-marital status" factor. The depression factor and the anxiety factor were intercorrelated, the size of the correlation being .505. The depression and anxiety factors had correlations with the "Truth-Social Desirability" factor of .14 and .05 respectively, and they had correlations with the age-marital status factor of —.01 and —.07 respectively. The sex variable had a loading of .11 on the depression factor and —.19 on the anxiety factor.

Some of the items were factorially impure and have been eliminated in drawing up the final scales. The items of the final scales are listed in Table 2 along with their loadings on the depression and anxiety factors.

The final scales were administered to 196 male and 357 female normal subjects. The split-half reliability of the depression scale based on the data from the males and females combined was .90. The reliability of the anxiety scale was .70. The intercorrelation of the two scales for the males was .40 and for the females .51.

C. CONSTRUCT VALIDITY STUDY I

Peterson (21) has obtained evidence indicating that scores on scales of neuroticism are significantly related to scores on the evaluative dimension of the Semantic Differential Scale (20). The hypotheses formulated for this study are based on Peterson's findings. They are as follows: (*a*) subjects with high scores on the anxiety scale will rate themselves as "passive" and other people and objects as "active" on the Semantic Differential, (*b*) subjects with high scores on the depression scale will rate themselves as "bad" and other people and objects as "good."

The anxiety and depression scales were administered to 126 students. The subjects were also asked to rate seven self-concepts (my morals, my body, my ideas, my intelligence, my voice, my behavior, myself), and seven nonself concepts (people, law, parents, work, country of birth, education, religion) on 12 seven-point semantic differential scales (six activity scales and six evaluative scales).

On the basis of scores on the anxiety and depression scales, four groups, 14 subjects in each group, were formed: (*a*) high-anxious group—subjects with scores above the 75th percentile on anxiety scale; (*b*) low-anxious group—subjects with scores below the 25th percentile on the anxiety scale (all the subjects in groups (*a*) and (*b*) had scores falling between the 25th percentile and 75th percentile on the depression scale); (*c*) high- and (*d*) low-depressive groups were formed in a similar manner.

The mean ratings of the self and nonself concepts on the activity scales for the high- and low-anxious groups are presented in Table 3. The mean ratings on the evaluative scale for the high- and low-depression groups are shown in Table 4. The higher the score on the activity scale, the more "active" the object being rated is perceived. The higher the score on the evaluative scale, the more "good" the object being rated is perceived.

Analysis of variance of the data indicated that neither of the interactions

TABLE 2
LOADINGS OF THE ITEMS FORMING THE FINAL DEPRESSION AND ANXIETY SCALES ON THE FACTORS OF DEPRESSION AND ANXIETY
(Analysis of data from 576 normal subjects and 115 psychiatric patients)

Scale	Depression factor	Anxiety factor	Depression factor	Anxiety factor
	Normal subjects		Psychiatric patients	
Depression scale				
I feel that life is worthwhile.*	—.46	—.05	—.98	.31
When I wake up in the morning I expect to have a miserable day.	.38	.18	.62	.17
I wish I were never born.*	.59	—.01	.71	—.05
I feel that there is more disappointment in life than satisfaction.*	.71	—.04	.78	.09
I want to run away from everything.	.62	.07	.48	.32
My future looks hopeful and promising.*	—.63	.11	—.90	.23
When I get up in the morning I expect to have an interesting day.	—.62	.04	—.64	—.01
Living is a wonderful adventure for me.	—.72	.08	—.77	.01
I am a happy person.	—.72	.08	—.70	—.04
Things have worked out well for me.*	—.73	.18	—.73	.04
The future looks so gloomy that I wonder if I should go on.	.69	.04	.67	.03

TABLE 2 (*continued*)

Scale	Depression factor	Anxiety factor	Depression factor	Anxiety factor
	Normal subjects		Psychiatric patients	
I feel that life is drudgery and boredom.	.68	.02	.53	.29
I feel blue and depressed.	.58	.12	.67	.19
When I look back I think life has been good to me.*	—.65	.14	—.44	—.10
Anxiety scale				
I get rattled easily.	.05	.62	.15	.64
When faced with excitement or unexpected situations, I become nervous and jumpy.	—.06	.69	—.03	.76
I am calm and not easily upset.	—.11	—.48	—.39	—.21
When things go wrong I get nervous and upset instead of calmly thinking out a solution.	.11	.59	.14	.64
It makes me nervous when I have to wait.	.06	.36	.09	.62
I am a tense "high strung" person.*	.08	.67	—.29	.84
I am more sensitive than most other people.*	.09	.34	—.10	.70
My hand shakes when I try to do something.	—.08	.44	.04	.55
I am a very nervous person.*	.09	.72	—.15	.84

* Item is answered by choosing from one of the following possible responses (score for each response is shown): Absolutely 9, Very definitely 8, Definitely 7, Probably 6, Possibly 5, Probably not 4, Definitely not 3, Very definitely not 2, Absolutely not 1.

Note: The remaining items are answered by choosing from one of the following possible responses (score for each response is shown): Always 9, Almost always 8, Very frequently (or usually) 7, Frequently 6, Fairly often 5, Occasionally 4, Rarely 3, Almost never 2, Never 1.

formulated in the hypotheses was significant. There was, however, a significant tendency for the high-anxious subjects to perceive things (self and nonself) as more "active" than did the low-anxious group ($F = 20.99$, *df* 1 and 52, $p < .005$). The high- and low-depressive groups did not differ significantly from each other in their activity ratings.

There was also a significantly greater tendency for the high-depression group to perceive things (self and nonself) as non-"bad" than for the low-depression group ($F = 43.48$, *df* 1 and 52, $p < .005$). The high- and low-anxious groups did not differ significantly from each other in their evaluative ratings.

TABLE 3
MEAN ACTIVITY SCORES OF HIGH- AND LOW-ANXIOUS GROUPS

Group	Self	Nonself
High anxious	4.61	4.13
Low anxious	3.75	3.78

TABLE 4
MEAN EVALUATIVE SCORES OF HIGH- AND LOW-DEPRESSION GROUPS

Group	Self	Nonself
High depression	4.93	4.63
Low depression	5.86	5.63

Although neither of the hypotheses was confirmed, the highly significant main effects found do suggest that the uncommon variance existing in the anxiety and depression scales may be of importance; and, thus, some support is given for the construct validity of the scales.

D. ITEM ANALYSIS WITHIN A PSYCHIATRIC POPULATION

Before decision could be made on the value of the scales as research instruments, it was necessary to do an item analysis on data obtained from psychiatric patients. It is by no means rare for scales that show up well within a normal population to appear less adequate as measuring instruments within a psychiatric population.

Data on the two scales in Table 2 and Comrey's Truth and Social Desirability Scales were obtained from 115 psychiatric patients. Consecutive admissions to a psychiatric hospital were used if they satisfied the following criteria: (*a*) age between 18 and 55 years, (*b*) not actively psychotic, (*c*) not mentally defective, (*d*) without language barriers, (*e*) without alcoholism, (*f*) without a primary diagnosis of epilepsy or chronic brain syndrome.

There were 91 female patients and 24 male patients. Their ages ranged from 18 to 55 years, with a mean of 34.15 years. Only 17 of the patients received education beyond the high school level. Seventy-five of the patients were of Protestant religion, 20 were Roman Catholic, two were Greek Orthodox, two Jewish, five atheist-agnostic, and 11 were unclassified. Sixty-eight of the patients had only one admission to hospital, 19 patients had two admissions, 11 patients had three admissions, three patients had four admissions, seven had five admissions, and seven had eight admissions. No data were collected on the diagnoses of the patients because of the doubtful validity of such diagnoses.

The intercorrelations between the items were factor analyzed by the method of minimum residual factor analysis (9). The first three factors were the only major ones, the remaining factors showing a considerable drop in total variance accounted for per factor. This was followed by oblique rotation of the three orthogonal factors for simple structure and meaningfulness.

The loadings of the depression and anxiety items on the first two factors, which were identified as a "depression factor" and "anxiety factor," are listed in Table 2. It can be seen that, generally, item homogeneity has not been lost within the psychiatric population.

E. Reliability and Correlations with Other Scales

The 115 psychiatric patients used in the item-analysis study were also administered the MMPI Depression scale and the Taylor Manifest Anxiety Scale. The intercorrelation between the MMPI D Scale and the Taylor MAS was .69 and between the new depression scale and the MAS was .20. The correlation between the new anxiety scale and the MMPI D Scale was .30. These correlations suggest that the new scales make a better job of separating anxiety and depression than do the MMPI D Scale and Taylor MAS.

The intercorrelation between scores on the new anxiety and depression scales for the 115 psychiatric patients was .40. The depression scale had a correlation of .36 with the Truth-Social Desirability Scale. The correlation of the anxiety scale with the Truth-Social Desirability Scale was .29. Though these correlations are of appreciable size, they are smaller than those usually obtained in connection with the intercorrelation of self-report scales and the correlations of these scales with measures of social desirability.

The correlations of scores on the new depression scale and age and sex were .03 and .04 respectively. The correlations of scores on the new anxiety scale and age and sex were .03 and —.07.

For 72 patients, data on the new anxiety and depression scales were obtained on two occasions—once on admission and once before discharge. On both occasions the patient was asked to answer the questions in relation to his condition just before admission into hospital. The test-retest reliability of the anxiety scale was .72 and of the depression scale .79. It would seem, then, that these measures of disordered affect, when the measurement is done in relation to a relatively fixed point in time, are quite reliable. Whether they are sensitive to changes in disordered affect will need to be determined in future research.

F. Discussion

The two new scales of anxiety and depression appear to measure dimensions that are more independent and less highly correlated with social desirability failure than are the MMPI Depression Scale and Taylor's Manifest Anxiety Scale. The scales appear to have an acceptable level of reliability, and scores on them are not influenced by age (within the 18-55 years of age) or sex.

The new depression scale is not considered to be an adequate substitute for such scales as Hamilton's rating scale for depression (15) and Beck's inventory for depression (1). It has a different purpose. Such scales as those of Hamilton and Beck have been developed to measure depressive states by means of symptom ratings. The depression scale presented here has been designed to measure a person's tendency to experience a depressive mood. Rather than being a substitute for such scales as those of Hamilton and Beck, it may provide a better measure of one particular symptom included in their scales—namely, depressive affect. Similarly, the new anxiety scale has been designed to measure a predisposition to develop anxious-affective states, rather than any groups of symptoms that may have been clinically associated with syndromes labelled "anxiety."

G. Summary

Two new scales of anxiety and depression are presented. In terms of item homogeneity, independence of scale scores, and the influence of social desirability, they appear to be an improvement over other scales of depression and anxiety.

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CULTURAL ORIENTATIONS AND THE USE OF COMMON OBJECTS IN IRAQ*

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A. INTRODUCTION

In his application of the Uses Test to Middle Eastern and American children, Dennis (1, 2) has shown that there are cultural variations in the functions attributed to identical familiar objects. These different functions may be taken as indications of differences in the dominant activities, values, and interests in these cultures. Thus, when a child is asked, "What is__________for?" his answer may reveal something about the dominant cultural orientations in his society; and if we have his answers to several questions of this kind, we may have indications of the dominant orientations in that society. Dennis found striking similarities between the responses of children from different parts of the Arab Middle East, and their responses were different from those given by American children. Zaidi (3) found that responses of Pakistan children are more similar to those of Lebanese and Sudanese children than to those of American children.

Since the first application of the Uses Test in the Middle East (1, 2), it has undergone many modifications; and the present study involves applying the final form of the test to four groups of children in Iraq.

B. METHOD

1. *Subjects*

The 280 primary school children tested in the present study fall into four groups: 99 boys and 63 girls from three public schools, and 54 boys and 64 girls from three private schools. Their age range was from 11 to 13 years. All were in Baghdad, and were tested in 1965.

2. *The Test*

The Uses Test in its present form consists of 50 questions taking the form of "What is 'referent' for?" The referents for these questions were selected

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for their universal familiarity and they are, therefore, suitable for cross-cultural studies. It has been found that subjects tend to give a variety of responses to each of the referents (2). The referents are as follows: the mouth, the hands, a mother, a father, a boy, a girl, a young man, an old man, a dog, a cat, a lion, a horse, a bird, stones, trees, water, a knife, candles, clouds, flowers, stars, mountains, storms, fire, silence, a brother, a sister, a grandfather, a grandmother, a strong man, a rich man, an army officer, the wind, the rain, the sunset, night, a coin, a holiday, a gift, a statue, sand, travel, school, new clothes, kneeling, running, dancing, shouting, singing, prayer.

The test was translated into Arabic and was given to the children while they were attending their classes.

3. *Scoring*

The answers were classified into seven scoring categories; and answers that do not fit those categories are designated as nonscorable (NS). The following categories and their definitions were taken from the unpublished scoring manual of the Uses Test by Dennis [in the 1960 report by Dennis (2) only four of these categories were used]:

a. Sustentative (S). All "uses" that refer to meeting the basic requirements of ordinary living, such as nutrition, liquid intake, clothing, bathing, work, rest.

b. Benevolent (B). Actions by living beings that aid persons, such as assisting and protecting, and actions that indicate friendship, love or goodwill. Actions by inanimate agencies that may help people, such as rain or sunshine, are classed as sustentative or hedonistic, unless the intention to help is definitely attributed to them.

c. Malevolent (M). As used here, malevolent is not the exact opposite of benevolent, since an answer is classified as malevolent if its referent is described as unpleasant, harmful, fearful, dangerous, noxious, anxiety-provoking, or anger-provoking, whether such results are intentional or not.

d. Hedonistic (H). The referent is described as causing pleasure, being liked, or being engaged in for pleasure.

e. Esthetic (E). An object or activity is called pretty, attractive, or beautiful. The distinction between the esthetic and hedonistic categories is sometimes a difficult one.

f. Religious (R). The answer refers to a deity, to a supernatural being, or to beliefs, ceremonies, symbols, books, persons, or events that are a part of some religious system.

g. Hierarchical (Hi). Any answer referring to high or low status or position, or to ambition, achievement, success, effort, or failure.

The following answers illustrate the scoring of question one: The child is asked, "What is the mouth for?" He may answer that it is for eating (S), helping you (B), biting someone (M), singing (H), reading the Bible (R), giving orders (Hi), or talking (NS).

C. RESULTS

Table 1 presents for each Baghdad group the means, standard deviations, and percentage of responses in each of the seven scoring categories. Table 1 shows that the four groups of Baghdad students are similar in their responses. For each group the highest percentage of responses is in the sustentative category and the lowest percentage is in the religious category. The second highest percentage for all groups is the benevolent, which is followed by hedonistic responses. Both hierarchical and esthetic percentages are lower than the hedonistic ones. While the girls have percentages of responses in the hierarchical

TABLE 1

THE MEANS, STANDARD DEVIATIONS, AND PERCENTAGES OF RESPONSES FALLING INTO THE SUSTENTATIVE (S), BENEVOLENT (B), MALEVOLENT (M), HEDONISTIC (H), HIERARCHICAL (HI), RELIGIOUS (R), ESTHETIC (E), AND NONSCORABLE (NS) CATEGORIES

	School boys		School girls	
Category	Public $N = 99$	Private $N = 54$	Public $N = 63$	Private $N = 64$
S %	35.4	35.9	32.3	33.5
M	17.2	17.3	15.7	16.1
SD	2.6	3.1	2.3	2.7
B %	21.6	20.5	24.8	24.5
M	10.5	9.9	12.0	11.7
SD	2.5	3.1	2.8	2.5
H %	14.5	12.1	13.9	14.0
M	7.1	5.8	6.8	6.7
SD	2.5	2.5	2.4	2.1
E %	4.5	5.4	5.3	6.4
M	2.2	2.6	2.6	3.1
SD	1.6	1.7	1.5	1.7
M %	4.6	4.3	4.7	4.2
M	2.2	2.1	2.3	2.0
SD	1.3	1.4	1.1	1.0
Hi%	6.5	7.3	5.2	6.4
M	3.2	3.6	2.5	3.1
SD	1.6	2.0	1.7	2.0
R %	3.3	3.3	4.1	2.7
M	1.6	1.6	2.0	1.3
SD	1.0	1.0	1.5	0.7
NS%	9.6	11.1	9.7	8.3
M	4.7	5.4	4.7	4.0
SD	3.7	4.4	3.0	3.3

and esthetic categories that are almost identical, in the case of boys hierarchical responses are higher than the esthetic ones. Girls obtained higher benevolent scores than boys. Finally, for all groups, malevolent scores are just above religious scores, which are the lowest in frequency.

D. Discussion

The results give us a general picture concerning the direction of activities and interests of children in Iraq. The children's responses do not seem to be affected much by sex or the kind of school they attend. That the highest percentage of responses is in the sustentative category supports a previous study in which it was found that food and work play a major part in the life of Middle Eastern children (1); pleasure and enjoyment seem to come low in their activities (e.g., low percentage of esthetic and hedonistic responses). The relatively high scores on benevolence may be the result of the dependence of the Middle Eastern individual on the help and assistance of his in-group and, in particular, his extended family. It may be noted that many of the test items refer to family membership.

The low frequency of religious responses may be related to the observation that Moslem religion is rigidly formalized into religious practices that may have little relationship with other aspects of the individual's daily life.

This interpretation may not be applicable to the more primitive part of the population, such as rural children or desert Bedouins. Indeed, Dennis (2) reported that his Bedouin group had obtained significantly higher religious scores than did urban groups in the Middle East.

In an authoritarian society where there is a harsh struggle for power and material gain among different religious, ethnic, and political groups, it is difficult to explain the low percentage of hierarchical responses. It is, however, possible that when a society is passing through a period of transition and social change, there is little respect for authority. The schools tested are in middle-class areas where the parents have recently reached their present professional and business positions. Going to school is admired among these parents and there seems to be tremendous change from the old harsh upbringing to the present more indulgent treatment of the child's demands. Children have not, therefore, felt the full impact of the traditional Middle Eastern emphasis upon authority.

E. Summary

The revised Uses Test was administered to 280 Baghdad school children. The results are in accord with the impressions and experience of an Iraqi psychologist.

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EFFECT OF ACUTE EXPOSURE TO ALTITUDE ON TIME ESTIMATION*[1, 2]

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A. INTRODUCTION

Hoagland (7, 8, 9) and Lindsley (11, 12) have shown a positive relationship between electroencephalogram (EEG) frequency and metabolic rate. Hoagland found that the function relating these variables could be described by the Arrhenius equation,[3] which relates the speed of a chemical process to the temperature of that process. Hoagland (6) also found that this equation described the function relating body temperature and subjective time, which led him to conclude that a biochemical process regulates subjective time rate. Hoagland postulated cellular metabolism as that biochemical process and hypothesized a "chemical clock" which is regulated by the speed of molecular motion involved in central nervous system metabolism. This hypothesis has been confirmed by Thor (15), Kleber, Lhamon, and Goldstone (10), and Rashkis and Rashkis (14).

Other research (1, 2, 3, 13) has found that the dominant alpha frequency of the normal EEG shifts to a lower frequency at high altitudes, the degree of shift (up to one cps) being directly related to the degree of anoxia. Brazier (2) attributed this slowing of the alpha waves to a depression of the metabolism of the cells in the cerebral cortex due to insufficient oxygen.

Since, as Hoagland suggested, time estimation is regulated by the rate of cellular metabolism in the central nervous system (c.n.s.), it was hypothesized in the present study that subjective time (the "chemical clock") would be slower at high altitude than at sea level, and would lead to an underestimation of clock time intervals.

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[2] Presented at the thirty-eighth annual meeting of the Eastern Psychological Association, April 1967.

[3] $\log_e (k_1/k_2) = u/R(1/T_2 - 1/T_1)$, where k_1 and k_2 are proportional to the velocity constants of an irreversible chemical reaction at the respective absolute temperatures, T_1 and T_2; R is a gas constant; and u is the temperature characteristic.

B. Method

1. *Subjects*

Thirty-eight soldiers ranging in age from 21 to 44 years who were participating in a high altitude project served as subjects (*S*s).

2. *Apparatus*

The apparatus consisted of six Standard clock timers, five Veeder Root 110 vac counters, five telegraph keys, one buzzer, and one key disabling switch.

3. *Procedure*

The study consisted of two phases: a sea level phase conducted at Fort Bragg, North Carolina, and a high altitude phase at Mt. Evans, Colorado (12,900 feet in altitude). The procedures for both phases were the same.

Three methods of time estimation were used. In the verbal estimation method, *S*s were required to write their subjective estimates of a 36-second interval which was delimited by two buzzes. This was repeated three times and the mean of the three estimates was taken as the *S*s' scores. In the production method, *S*s were required to produce a 22-second interval by depressing a telegraph key for that period of time. Their estimates were recorded on electric clock timers wired to the keys. Again, the means of three estimates was taken as the *S*s' scores. In the tapping method, *S*s were asked to tap on telegraph keys at a rate of one-per-second during a 30-second interval. The total number of taps given was recorded and the mean of three such totals served as the *S*s' scores.

C. Results and Discussion

The means, standard deviations, and *t* and *p* values for the sea level and altitude conditions are shown in Table 1. The difference in time estimation by the production method between sea level and altitude was significant at the .025 level in the predicted direction. That is, subjects underestimated time

TABLE 1
Means, Standard Deviations, and *t* and *p* Values for Sea Level and Altitude Estimates by Each Method

Time estimation method	Sea level		Altitude			
	Mean	*SD*	Mean	*SD*	*t*	*p*
Verbal estimation	34.26	9.89	31.83	9.18	1.2789	$< .10$
Production	23.63	5.38	25.27	6.34	2.3265	$< .025$
Tapping	30.10	9.05	28.27	7.84	1.2194	$< .15$

intervals at altitude compared to time intervals at sea level. The verbal estimation and tapping methods also indicated an underestimation of the time intervals at altitude at the .10 and .15 levels, respectively. It should be noted that, since the production method was recorded according to objective (clock) time and the verbal estimation and tapping methods were recorded according to subjective time, the apparent reversal of trend shown by the production data in Table 1 is actually consistent with the direction of differences shown by the other methods. All methods showed a slowing of subjective time at high altitude.

The data, then, confirmed the hypothesis, and are consistent with Hoagland's "chemical clock" hypothesis and with the hypothesis that alpha frequency and subjective time are regulated by the same internal pacemaker.

Because of the difference shown in the sensitivity of the three time estimation methods to environmental stress, intercorrelations among them were run to determine if there was a "best" method for use in this type of study. The highest significant correlations found were between the production method and the other two methods, and between the production methods at sea level and altitude (see Table 2). These intercorrelations suggest that the production method is the preferred method for use in studies of time estimation and stress. This agrees with the results of Frankenhaeuser (4) and Hawkes, Joy, and Evans (5) who also found that the production method was most sensitive to physiological change.

TABLE 2
INTERCORRELATIONS AMONG THE THREE METHODS OF TIME ESTIMATION AT SEA LEVEL AND ALTITUDE

Time estimation method	Verbal estimation (sea level)	Production (sea level)	Tapping (sea level)	Verbal estimation (altitude)	Production (altitude)	Tapping (altitude)
Verbal estimation (sea level)	1					
Production (sea level)	—.37*	1				
Tapping (sea level)	.12	—.35*	1			
Verbal estimation (altitude)	.25	—.49*	.34*	1		
Production (altitude)	—.29	.68*	—.21	—.62*	1	
Tapping (altitude)	—.08	—.22	.42*	.25	—.33*	1

* Significant at .05 level of confidence.

D. SUMMARY

The hypothesis that subjective time is slower at high altitude than at sea level was tested. Thirty-eight soldiers estimated short time intervals by three methods (verbal estimation, production, and tapping) at sea level and at 12,900 feet altitude. The results confirmed the hypothesis by the production method and are interpreted as being consistent with Hoagland's "chemical clock" hypothesis.

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AGE DIFFERENCES AND SCORING DIFFERENCES IN DICHOTIC LISTENING PERFORMANCE*[1]

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A. INTRODUCTION

It was first suggested by D. E. Broadbent that the ability successively to reproduce a series of digits when this has been presented as two simultaneous half-spans to each ear, depends in part upon some short-term storage mechanism. Thus, in one experiment Broadbent (1) showed that when digit-span stimuli were relayed at a speed of two per second through headphones, the one half of the span to one ear, and, simultaneously, the other half of the span to the other ear, then the subjects tested under these conditions could reproduce the digits sequentially. Furthermore, in such reproduction, elements from the one half of the span were but rarely alternated with elements from the other half. The first half-span recalled, however, commonly contained fewer errors than the second half, producing a kind of serial-order effect. Broadbent put forward the hypothesis that two kinds of mechanism may underlie such performance on this modified digit-span test. First, there is a "p-system" which can only pass information successively. Second, there is an "s-system" which can store excess information arriving, for example, when the p-mechanism is already fully occupied in transmitting information from another channel. In each case the half-span of digits recalled first passes directly through the p-system, while the half-span recalled second spends some time in storage.

There is a growing body of evidence that human memory function may depend upon the efficiency of this kind of short-term storage stage of the learning process.

Inglis (8), for example, initially suggested that the defect of acquisition that has been found in elderly psychiatric patients suffering from memory disorder might be based upon a breakdown of this kind of storage mechanism. Such patients should, therefore, show disturbance of recall in those half-sets of digits reproduced second in the dichotic stimulation situation, relative

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to the performance of a matched group of patients without memory disorder. This expectation was confirmed by Inglis and Sanderson (12) for the case in which the two channels for simultaneous stimulation were the two ears. Caird and Inglis (5) confirmed these results and extended them to the case in which the ear and eye were together presented with different digits.

Inglis (9) pointed out that, since increasing age also seems to affect learning capacity and as such impairment may likewise depend on changes in short-term storage, responses to dichotic stimulation might vary with normal aging too. If age primarily affects storage then the reproduction of the first half-set recalled should not be affected by advancing years. If the second half-set recalled must pass through the storage process, then the recall of these digits should be affected by age.

This expectation has now been confirmed in a number of studies. In the first of these, Inglis and Caird (11) examined the changes in sequential responses to simultaneous stimulation in 120 subjects between the ages of 11 and 70. In another study, Mackay and Inglis (13) examined the responses of 160 subjects between the ages of 11 and 90. The results of these two experiments, carried out on different subjects by different experimenters, proved to be in very close agreement. As age increased there was little or no significant impairment in the ability to recall the half-spans reproduced first. Progressively and significantly greater difficulty was, on the other hand, shown in the reproduction of the second half-spans. Furthermore, the longer the span to be recalled, the greater the difference there was, overall, between the first and second half-spans. A further confirmation of these findings was secured by Inglis and Ankus (10) and somewhat similar results have also been reported by Broadbent and Gregory (2) and by Craik (6).

Despite the consistency of these results, however, the objection has been raised that the age differences found in dichotic listening performance, though apparently congruent with hypothesis, might be a function, if not indeed simply an artifact, of the scoring system most frequently used. This has usually involved "fixed-order free-recall," as follows: The first digit reproduced by the subject after he has heard a complete set of digits has been used to determine in each case which channel was taken to be the half-span recalled first. The score for each channel was the average number of correct responses for each half-span of digits of any given length, taking each digit's position in the series into account. If, as sometimes happened, the first digit recalled was not in fact the first term of either half-span then this sequence was regarded as "spoiled" and excluded from the scoring calculations.

Critics have from time to time claimed that this method of scoring may, in fact, have biased the results obtained. It has been suggested, for example, that since the first channel, by this method, is defined in terms of the first correct reproduction, then this channel must inevitably secure superior scores. This objection could, of course, be answered in two ways. In the first place, this technique of channel determination might possibly produce a kind of constant error in favor of the first channel of recall, but such a constant error could not, in itself, account for the crucial differences in second channel recall which have been shown to vary systematically with age and learning disorder. In the second place, conditions of "fixed-order fixed-recall" have also been used by Inglis and Ankus (10), thus providing a condition in which channel order did *not* depend on the subject's choice but was specified by the experimenter's instructions. Results comparable to those of the "fixed-order free-recall" experiments were nevertheless obtained.

It is to be feared, indeed, that a different kind of bias may have influenced the results of those studies that have applied other, and perhaps more lenient, scoring systems to the evaluation of dichotic listening performance. Bryden (3) has tried to distinguish ear-order of report from temporal-order of report in the recall of dichotic digits. It is difficult to see how we may, however, confidently discriminate between real errors and mere guesswork in the detection of transpositions from one channel to another, when the subject is only dealing with items drawn from a very small vocabulary of some nine or 10 items, as is the case in the recall of dichotic digits.

Despite these counter-arguments it certainly seemed necessary to examine the possible effects of different scoring methods on age differences in dichotic listening performance. This need has been made the more urgent by the results of a recent study by Friedman (7). He has shown, in the rote learning of letter series, that old subjects (60-81 years) were only inferior to young subjects (20-34 years) when order was taken into account. Friedman concluded that, "Analyses of variance indicated that, regardless of criterion of capacity level used, the aged group performed significantly poorer than the young group when the individual capacity level was exceeded by one through five or six letters. The importance of the organizational factor was highlighted when the results were scored without concern for correctness of order, and no statistically significant differences between the groups were observed. The findings could then be understood within a genetic framework that can describe senescent memory functioning in terms of reversal in the development of memory pattern with concomitant re-emergence of genetically lower levels of organization" (7, pp. 7-8).

The present study, therefore, had a twofold aim. It was intended to develop dichotic stimuli that would permit of a more objective scoring than has been the case when digits alone are used. It was also intended to discover what effect, if any, altered scoring methods might have on previously found age differences.

B. Subjects and Method

The subjects comprised two groups, one old, one young. The elderly subjects were 20 volunteers (10 male, 10 female) between the ages of 55 and 71 (mean age 60.55). All were healthy and active and none suffered from any hearing difficulty severe enough to impair performance on the auditory tasks used. The young subjects were 20 volunteers (10 male, 10 female) between the ages of 18 and 25 (mean age 22.40); they were mainly secretaries, technicians, and hospital employees.

The dichotic tape was prepared on a modified Ampex 602-2 recorder, and the same male voice was used on both channels. The simultaneous stimuli in each case involved a paired monosyllabic digit and color-name. Dichotic listening performance for words other than numbers had previously been shown to vary systematically with age by Caird (4).

Each subject was told that he would hear numbers in one ear and color-names in the other and was told the range from which each might be chosen. He was also told before the stimuli were delivered which ear he had to recall first; on half the occasions this was the right ear; on the other half, the left. On half the occasions the right ear heard digits, the left colors, and *vice versa*. There were 16 presentations of one, two, and three pairs of dichotic stimuli. Different kinds of material in the two channels were used so as to enable errors and guesses to be separately detected.

Three scoring methods were applied to each subject's performance, as follows:

1. This was the method characterized above as "fixed-order fixed-recall." If, for example, the subject was asked before delivery of the stimuli to recall the right-ear material first and was then dichotically presented with the digits "four-six-one" in the right ear and the color-names "gray-blue-green" in the left, then only the recall of these words in this order would secure a perfect score of three for each channel. If, on the other hand, the subject recalled "four-six-gray" and then "one-two-green," he would score two for the first channel performance and one for the left.

2. By the second scoring method a subject was given a single score for total performance on each span rather than separate scores for each half-span. Each item got one point for being recalled in the correct channel and another point

for appearing in the correct position. Perfect performance on a three-pair item would thus obtain a score of 12. When the example cited above is used, a response of "six-one-four-gray-blue-green" would get a score of nine, while "four-blue-one-gray-green-six" would be given a score of seven. In addition, if a subject did not recall all the items but indicated where he had to omit an item, this was given credit so far as the correct positions of the other items were concerned.

3. The third method gave one point to each item correctly recalled regardless of channel order or position within sequence. Thus, in the example used above, both the recall of "four-six-one-gray-blue-green" and the recall of "one-gray-four-blue-green-six" would get a "perfect" score of six; only omissions or errors of intrusion lost points.

C. Results and Discussion

The results obtained may best be discussed in terms of the three scoring systems defined above.

1. The first scoring system describes accuracy on two channels separately. The original expectation put forward by Inglis (9) was that age should affect performance on the second channel, but not the first, for each length of digit span. The results obtained in this study are shown in Figure 1.

The results of analysis of variance uphold what seems evident from inspection of the figure. There is a significant difference in accuracy for material recalled first in sequence between the young and the old groups for all span lengths. This confirms Craik's findings (6) rather than Inglis' original expectations (9). There are, however, in accord with these latter expectations, even greater differences between young and old in the material recalled second in sequence. Furthermore, in the case of the material from the second channel of recall the difference between young and old very markedly increases with digit-span length, as would be expected if these results reflect an increasing load on some short-term storage capacity which decreases in efficiency as age advances.

2. The second scoring system, although less complex than the first, still involves recall of both content and organization. The results obtained from it, and the significance of the differences between the groups are shown in Table 1.

It can be seen from this table that for all three lengths of span there is again a highly significant difference between the age groups.

3. The third scoring system would appear not to involve "organization" in the sense used by Friedman (7). The differences found between the age groups are shown in Table 2.

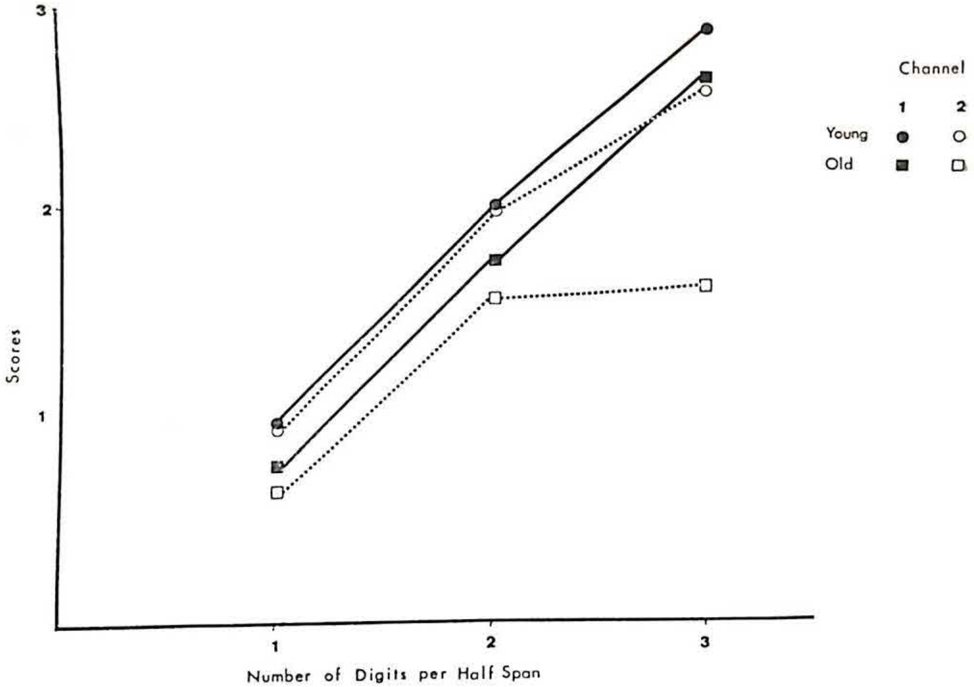

FIGURE 1
SCORES ON FIRST AND SECOND CHANNEL RECALL FOR THE TWO GROUPS FOR THREE LENGTHS OF DIGIT SPAN AS ESTIMATED BY THE FIRST SCORING METHOD (FIXED-ORDER FIXED-RECALL)

These results reveal that, in the case of dichotic listening performance at least, even when the order of word sequence is ignored, the members of the older age group recalled significantly fewer of the items for each length of span.

In general, then, the results of this study confirm that differences between extreme age groups in dichotic listening performance are found even when words other than digits are used. The age differences previously found are not simply an artifact of the scoring procedures formerly used. The differences that appeared on the first channel of recall are not precisely in line with the

TABLE 1
MEANS, STANDARD DEVIATIONS AND THE SIGNIFICANCE OF THE DIFFERENCE BETWEEN YOUNG AND OLD GROUPS IN TERMS OF THE SECOND SCORING SYSTEM USED

	Groups					
	Young		Old			
Number of items per half-span	*M*	*SD*	*M*	*SD*	*t*	*p*
1	3.66	.31	2.73	.70	5.32	$<.001$
2	7.86	.19	6.85	1.41	3.12	$<.05$
3	11.05	.94	9.12	1.30	5.23	$<.001$

TABLE 2
MEANS, STANDARD DEVIATIONS AND THE SIGNIFICANCE OF THE DIFFERENCE BETWEEN YOUNG AND OLD GROUPS IN TERMS OF THE THIRD SCORING SYSTEM USED

Number of items per half-span	Young *M*	Young *SD*	Old *M*	Old *SD*	*t*	*p*
1	1.94	.06	1.63	.22	6.10	$<.001$
2	3.97	.05	3.58	.47	3.53	$<.01$
3	5.61	.39	4.90	.62	4.27	$<.001$

bulk of past findings; they could conceivably be due to the fact that in this case only extreme groups were used, whereas previous studies have used groups spanning the whole range of adult ages.

In any case, differences in the second channel of recall were larger between the groups and varied more markedly with the amount to be recalled, as if subjects in the older group were more susceptible to overload of short-term storage capacity.

D. SUMMARY

It has previously been found that age is an important source of variance in dichotic listening. A decrease in performance has been found in groups of subjects after the third decade of life. It has been argued, however, that some part of this apparent alteration in capacity might be due to the particular scoring methods applied; in particular, it has been suggested that "fixed-order" recall requirements may penalize older subjects by calling upon a diminished organization ability.

Dichotic stimuli were used that permitted the easy detection of transposition errors, and scoring methods were devised so as to involve varying degrees of organizational skill.

It was found, whether the scoring criteria required more or less organization of the data received, that differences in dichotic listening performance continued significantly to discriminate between a young and an elderly group.

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NEWS NOTES

Under this heading appear selected items that are considered to be of special interest to psychologists.

A national conference on Content Analysis is being planned for November 17-19, 1967, at the University of Pennsylvania. Well-known researchers in various fields are preparing some two dozen specially commissioned papers in such general areas as "Theory and Definition," "Recording and Notation," "Inference," and "Computer Techniques and Computational Linguistics." Meetings will be open to the public. For further information write Dean George Gerbner, Annenberg School of Communications, University of Pennsylvania, Philadelphia, Pennsylvania 19104.

* * *

The annual convention of the National Society for Crippled Children and Adults (the Easter Seal Society) will be held November 16-19, 1967, at the Century Plaza Hotel, Los Angeles, T. A. Mangelsdorf, president, announced.

Hundreds of board members, volunteers, and professional staff members from every state and Puerto Rico will gather to explore new developments in the rehabilitation of the crippled. For further information write to National Society for Crippled Children and Adults, 2023 West Ogden Avenue, Chicago, Illinois 60612.

* * *

During August 7-18, 1967, The University of Michigan College of Engineering will offer an intensive course in the theory, technology, and application of lasers. The course is designed for practicing engineers and scientists who desire a firm understanding of the subject but cannot spare more than two weeks away from their work.

This course will cover the fundamentals of gas lasers, impurity lasers, semiconductor lasers, coherent optics, and holography, followed by a detailed consideration of specific lasers and their applications.

Correspondence concerning course content or prerequisite should be directed to Professor G. W. Stroke, 1213 Institute of Science and Technology, The University of Michigan, Ann Arbor, Michigan 48104. Telephone: Area Code 313, 764-5207.

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Leonard M. Shaw, A.C.S.W., is planning to compile a *Directory of Marathon Therapists*. All counselors and therapists who are doing Marathon Therapy may arrange to be listed in the directory by writing Mr. Shaw at 1931 E. Calhoun Street, Seattle, Washington 98102.